WORLD

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Newsletter No. 10
OCTOBER, 1944

Published by Rubber Chemicals Division of DU PONT

TOMORROW'S OUTLOOK FOR RUBBER COLORS

WAR forced the almost complete withdrawal of colors except for some few essential products. There had been a healthy trend to greater use of color and that tendency has only been interrupted by the war. Marketing experts, buyers, designers believe that interest in color will spread in the postwar market. They expect consumers to be color hungry, widely receptive to colorful items as a welcome relief to the colorless, black or utilitarian war goods.

Now is the time for the rubber goods manufacturer to get ready to meet this demand, to consider colors for all those products that either have not been made at all during the last two years or have been made in black only.

DU PONT SELECT COLORS—Anticipating the color trend, du Pont has made available a group of excellent organic colors, the best we have ever produced. These colors, designated as SELECT, were carefully selected from many because of their remarkable brilliance, high tinctorial power, good dispersibility, excellent light-fastness, stability to various curing conditions, freedom from bleeding, migration and crocking; also other properties that are desirable in high quality colors for use in rubber, synthetic rubbers and their latices. The high covering power of these colors permits use of smaller amounts, thus their cost, based on tinctorial strength, is in many cases lower than that of other colors having inferior properties. This group of SELECT colors may be used with equally satisfactory results in rubber, neoprene and butadiene rubber. In dry compounding either dry powder or GR-S dispersed colors may be used. For latex, a complete line of dry powder colors is available.

SELECT Dry Powder Colors cover a very wide range of hues by blending them in proper proportions. It is possible by blending to obtain almost any hue in the visible spectrum.

SELECT Dispersed Colors—Similar in form to the du Pont Rubber Dispersed Colors offered before the war but dispersed in GR-S.

Color Matching—It is impossible to match a sample of colored rubber without knowing the exact formula, the brands and types of ingredients used, and the temperature, duration and type of cure. When requesting a color match, quicker and better results can be obtained if such information is furnished, or better still, if a pound or two of the base stock is submitted together with the method, time and temperature of cure.

Some of the characteristics of du Pont SELECT Colors are given in Table I. Additional information and samples may be had on request.

TABLE I. PROPERTIES OF DU PONT SELECT RUBBER COLORS

	*Red WRT	*Red 2B	*Orange F	*Yellow G	*Green GSD	*Blue CP	*Blue YDE	Blue GD
Press Cure	Good	Good	Good	Good	Good	Good	Good	Good
Open Steam Cure	Good	Good	Good	Good	Good	Good	Good	Good
Cold Cure	Good	Good	Good	Good	Good	Good	Good	Good
Ammonia Cure	Good	Good	Very Good	Unsatisfactory	Good	Good	Unsatisfactory	Good
Hard Rubber	Good	Good	Good	Good	Good	Good	Good	Good
Light-Fastness	Excellent	Excellent	Excellent	Good	Excellent	Excellent	Excellent	Excellent
Migration	None	None	None	Trace	None	None	None	None
Crocking	Very Slight	None	None	Slight	None	Slight	Slight	None
Specific Gravity	1.48	2.0	1.09	1.05	1.08	1.51	2.78	1.1
Effect on Cure	None	None	None	None	None	None	None	None
Bleeding—Boiling Water	None	None	None	None	None	None	Slight	None
Bleeding—10% Soap Solution	None	None	None	None	Slight	None	Bleeds	None

*Offered in both powder and GR-S dispersed form.

DU PONT

RUBBER CHEMICALS DIVISION

BETTER THINGS FOR BETTER LIVING . . . Through Chemistry

INDIA RUBBER WORLD, October, 1944, Vol. 111, No. 1. Published monthly by BILL BROTHERS PUBLISHING CORP., 1309 Noble Street, Philadelphia 23, Pa. Editorial and advertising offices, 386 Fourth Avenue, New York 16, N. Y., U. S. A. Entered as second-class matter October 5, 1889, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription, United States and Mexico, $3.00 per year; all other countries, $4.00; single copies, 35 cents.

Tech

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OCT 25 1944
DETROIT

There is an OROPLAST

For Every GR-S Processing Need

OROPLAST L for smooth tubing operations and for soft stocks of 40° hardness.

OROPLAST M for calendering, tubing and skim coating operations; for all molded goods.

OROPLAST H for carbon black master batches; for maximum plasticity of raw stock at processing temperatures; for tear resistance at elevated temperatures.

All grades of Oroplast produce highest elongation values without sacrificing tensile strength. Oroplasts are uniform chemical products designed and produced for the specific purpose of softening and extending GR-S rubber.

Write for our suggested formulations, using Oroplast in mechanical rubber goods from GR-S.

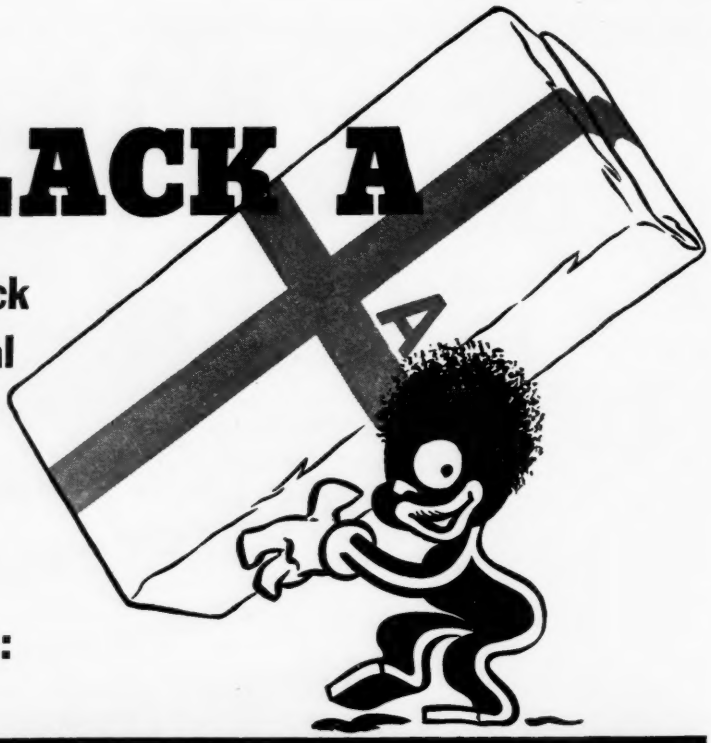
PRODUCT OF THE
ORONITE CHEMICAL COMPANY
OF SAN FRANCISCO, CALIF.

Sole Distributors

ADVANCE SOLVENTS & CHEMICAL CORPORATION

245 Fifth Avenue • New York, N. Y.

PHILBLACK A



A new and improved black for Synthetic and Natural Rubbers. This unique new type H M F black whose stock imparts a combination of these desirable characteristics:

EASY PROCESSING
HIGH RESILIENCE
GOOD PLASTICITY
GOOD ABRASION RESISTANCE
LOW HEAT BUILD-UP
HIGH TENSILE STRENGTH
HIGH RESISTANCE TO CUT AND CRACK GROWTH

This excellent combination of qualities makes Philblack A especially valuable for use in compounding both tire and mechanical goods made from synthetic rubber.

For complete data on Philblack A performance write today for our new fully informative book "Philblack A." No charge or obligation.

PHILLIPS PETROLEUM COMPANY
Philblack Division

FIRST CENTRAL TOWER • AKRON, OHIO

3 IMPORTANT SUGGESTIONS For Your GR-S Stocks

1 To protect the polymer during processing, particularly the effects of high temperatures in breakdown or mixing, add one percent (on 100 GR-S) of

BLE-POWDER

2 To protect your GR-S products from effect of static exposure to sunlight and ozone, add one to three percent (on 100 GR-S) of

SUNPROOF

3 To protect your GR-S products in service, to maintain their best characteristics over the maximum time, accelerate the compounds with a thiuram

MONEX-TUEX-ETHYLTUEX-PENTEX

PROCESS . . . ACCELERATE . . . PROTECT with NAUGATUCK CHEMICALS

Naugatuck Chemical

DIVISION OF UNITED STATES RUBBER COMPANY
ROCKEFELLER CENTER NEW YORK 20, N. Y.

IN CANADA: *Naugatuck Chemicals Division, Dominion Rubber Co., Elmira, Ont.*

It pays to be adaptable!

After the war, Crown Zipper engineers will adapt—or if necessary, *create*—special applications to meet special needs!

A lot of old-fashioned notions were exploded when Crown Zipper engineers went into the field with our armed forces to adapt zippers to military jobs.

Crown engineers proved that zippers can be big and tough yet easy to operate, small and dainty yet virtually indestructible!

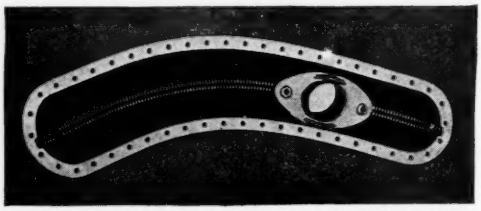
They proved zippers can be made that actually slide freely around sharpest curves!

They proved two or more sliders can be put on the *same* zipper track—to provide openings at any given point with smooth closures in both directions!

In fact, they made more big, important improvements in zipper design than anyone dreamed possible. (See complete list of Crown superiorities below.)

But perhaps the most important thing they proved is that zipper designs don't *have* to be "frozen"—zippers can be *adapted* to the *job!*

When *you* turn to postwar, Crown engineers will be able to show you exactly what this means in terms of longer zipper life and easier operation in rubber goods applications. Crown engineers will adapt—or, if necessary, *create*—special Crown Zippers to meet your own individual manufacturing problems!



"DOUBLE-ACTING" CROWN ZIPPER ON AIRCRAFT GUN TURRET OPENS AHEAD OF GUN OPENING, CLOSES BEHIND IT.

CROWN ZIPPERS are 5 ways better

1. Takes sharp curves

2. Die-cast for smoother action—extra strength

3. Provides opening wherever you want it

4. Won't lock open

5. Resists corrosion

Member of the J. & P. Coats • Clark's ONT *Family*

THE SPOOL COTTON COMPANY • *745 Fifth Avenue, New York, N. Y. (Crown Fastener Division)*

When you get a *lot* more—
You can afford to pay a *little* more

HYCAR Synthetic Rubber is a superior product which naturally commands a premium price. A true comparison with other materials is impossible because there is no other group of synthetic rubbers exactly like Hycar.

By the time compounding and processing economies inherent in Hycar are considered, this premium material costs no more than less desirable synthetic rubbers and results in higher quality products.

Take a look at some of the advantages of Hycar as compared to other oil-resistant types:

- . . . *Better storage stability in crude and compounded states—won't set up—no stickiness*
- . . . *Lower specific gravity means 25% more volume in finished product*
- . . . *Better oil and gas resistance*
- . . . *Can be blended with GR-S and maintain adequate oil resisting characteristics*
- . . . *Will take higher pigment loadings without undue sacrifice of quality*
- . . . *Better extrusion characteristics—maintains shape during processing —won't collapse*
- . . . *A variety of combinations of properties not otherwise obtainable*
- . . . *Excellent performance in severest types of service has been proved throughout all industry*

Hycar's Technical Service Staff is at your service, ready to help you with your individual problems. *Hycar Chemical Co., Akron 8, Ohio.*

Hycar

Reg. U. S. Pat. Off.

LARGEST PRIVATE PRODUCER OF BUTADIENE TYPE

Synthetic Rubber

KEEP YOUR EYE ON THIS PICTURE

and you'll see more and more Taylor Flex-O-Timers

IT'S TRUE! The Taylor Flex-O-Timer is becoming more and more important in the synthetic rubber picture, because synthetic rubber curing needs even more precise temperature and pressure control than crude rubber.

In this particular picture, you're looking down between two rows of McNeil 45" Twin Steam Dome Presses for curing synthetic rubber tires. The heart of each one is the Taylor Flex-O-Timer which controls the sequence and duration of all functions from the closing to the opening of the press. All the operator has to do is load the press and push the button—it does the rest!

BUY ANOTHER WAR BOND TODAY!

On the right side of each press are two Taylor Double-Duty Fulscope Recording Controllers which control press temperature and condensate removal in each cavity, and the Taylor Bi-record Recording Pressure Gauge that records the bag pressure for each tire.

Whatever your production problem, there's a good chance Taylor Accuracy can help you. Ask your Taylor Field Engineer or write Taylor Instrument Companies, Rochester, N. Y. or Toronto, Canada. *Instruments for indicating, recording, and controlling temperature, pressure, humidity, flow and liquid level.*

ARMY E NAVY

Taylor Instruments

MEAN

ACCURACY FIRST

IN HOME AND INDUSTRY

A CONSTANTLY GROWING SERVICE
in the field of rubber compounding
NAFTEX
WILMEX M
ECONO-PLAST
NAFTOLEN EMULSION
MULTI-PLAST HV
MULTI-PLAST MV
NAFTOLEN
Extensive research directed toward the critical needs of the rubber chemist has resulted in the development of several new WILCHEM products. Other products will follow. Our aim—through our new products, our technical representatives, and our research laboratory—will be to provide you, the rubber chemist, with a continually expanding service in the field of compounding.
WILMINGTON
CHEMICAL CORPORATION
10 EAST 40TH STREET • NEW YORK 16, N. Y.

LOEWENTHAL RUBBER

A
CYCLE OF
SERVICE
TO THE
RUBBER INDUSTRY
THAT HAS NOT
BEEN BROKEN
SINCE
1868

As specialists in SCRAP RUBBER we have served the reclaiming industry since its inception, our long experience and expert attention insuring scrap that always comes up to specifications.

THE LOEWENTHAL CO.

JACK SIDER, *President* J. K. McELLIGOTT, *Exec. Vice-Pres.*

We Solicit Your Inquiries

188 W. RANDOLPH STREET
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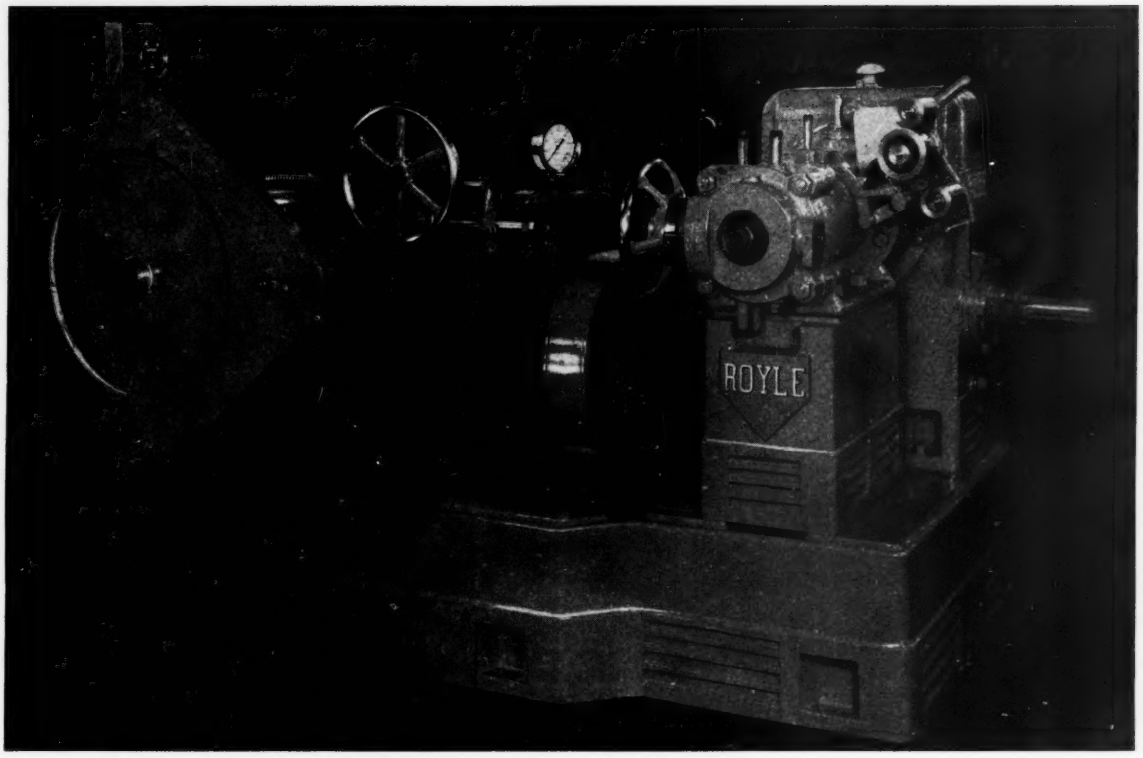
159 CLEWELL STREET
AKRON 5, OHIO

Cable Address: "Gyblowell"



No. 2 Royle Continuous Vulcanizing Machine

"ANY INSULATION" WON'T DO
When You're Fighting A Global War

"Fifteen hours after 'things' had quieted down we were using the airstrip. - - - run telephone lines to the important stations and installed field sets. That night - - - - lines and many other things were blown to bits."

That is the way it is on fighting fronts around the world. It is to the credit of American ingenuity and industry that material and equipment to maintain communications under such conditions is available in sufficient quantities.

Today Royle Continuous Vulcanizing Machines are delivering insulated wire in many of the nation's wire processing plants—"enough and on time."

JOHN ROYLE & SONS

ROYLE PATERSON N. J.

PIONEER BUILDERS OF EXTRUSION MACHINES SINCE 1880

Continental Europe
James Day (Machinery) Ltd.
London, England

Home Office
B. H. Davis J. W. VanRiper
SHerwood 2-8262

Akron, Ohio
J. C. Clinefelter
UNiversity 3726

PATERSON 3, NEW JERSEY

And now we add *Embossing* to make CLOTH serve more people . . . more ways . . .

Embossing is a surface treatment generally applied to coated cloth to secure a decorative effect or to simulate a naturally irregular surface. One of the most common forms of embossed treatment copies various leather finishes and many so-called "imitation leathers" have all of the appearance value and much of the durability of leather and, in addition, are waterproof, non-porous and uniform. Various coarse fabric textures are embossed as well as all-over designs. A combination of embossing with printing (color on high spots) produces unlimited pleasing contrasts.

EMBOSSING

Under pressure a relief pattern is produced in the plastic coating. The cloth structure is in no way damaged or weakened. For certain industrial uses embossing may create lines or marks of functional value.

CURRENT HOLLISTON PRODUCTION includes COATED AND IMPREGNATED FABRICS . INSULATING CLOTH BASE . . SEPARATOR CLOTHS rubber, starch-filled, glazed. TRACING AND BLUE PRINT CLOTHS white and blue, ink or pencil. MAP CLOTH, PHOTO CLOTH, self-adhesive. REINFORCING FABRICS. SIGN, LABEL AND TAG CLOTHS, waterproof to take any ink, meet any inking problem. BOOK-BINDING CLOTHS. SHADE CLOTH, impregnated waterproof, opaque, translucent or light proof.

We urge you to consider CLOTH, and invite you to consult with us concerning possibilities and developments for your specific requirements.

The Holliston Mills, Inc.

PROCESSORS OF CLOTHS FOR SPECIAL PURPOSES

NORWOOD, MASSACHUSETTS

Sales Agents in Principal Cities

General Chemical "B&A" Reagent Acids and Ammonia

Quality in quantity shapes success...increases product potentialities. That's why, wherever *reagent grade mineral acids or ammonia in commercial quantities* are specified for industrial operations, General Chemical "B&A" high purity products are an outstanding choice nation-wide.

These reagents from America's foremost producer of mineral acids conform to exacting A.C.S. specifications. Their quality and purity are the result of General Chemical's progressive research and advanced reagent production technique, combined with invaluable "know-how" gained during almost half a century's manufacture of basic chemicals for industry.

Specify and rely on General Chemical "B&A" Reagent Acids and Ammonia for your operations. Remember...their dependability has been "proved in production" by America's leading manufacturers!

GENERAL CHEMICAL COMPANY

GENERAL CHEMICAL COMPANY
40 RECTOR STREET, NEW YORK 6, N. Y.

Technical Service Offices: Atlanta • Baltimore • Boston • Bridgeport (Conn.) • Buffalo • Charlotte (N. C.) • Chicago • Cleveland • Denver Detroit • Houston • Kansas City • Milwaukee • Minneapolis • New York Philadelphia • Pittsburgh • Providence (R. I.) • St. Louis • Utica (N. Y.)

Pacific Coast Technical Service Offices:
Los Angeles • San Francisco • Seattle, Wenatchee and Yakima (Wash.)

In Canada: The Nichols Chemical Co., Ltd. • Montreal • Toronto • Vancouver

General Chemical Reagent Acids and Ammonia are produced by the Company's Baker & Adamson Division, makers of laboratory reagents and fine chemicals since 1882. The experience of this Division with high quality chemicals embraces over 1,000 purity products.

• • •

"B&A" Sulfuric Acid, Reagent, A.C.S.
Sp. Gr. 1.84
"B&A" Hydrochloric Acid, Reagent, A.C.S.
Sp. Gr. 1.18–1.19
"B&A" Nitric Acid, Reagent, A.C.S.
Sp. Gr. 1.42
"B&A" Ammonium Hydroxide, Reagent, A.C.S.
Sp. Gr. .90
"B&A" Acetic Acid Glacial, Reagent, A.C.S.

Quantities: "B&A" Reagent Acids and Ammonia are available in carboys as well as in five-pint or one-pound bottles, which are obtainable in case lots or less.

• • •

Stocked at key locations throughout the nation.

A Timely Reminder!

Pelletex and Gastex

The Leading Semi-Reinforcing Blacks (Furnace Type) for Natural and Synthetic Rubber Compounds

Easy Processing
Low Heat Build-up
Superior Aging
Low Permanent Set
High Resistance to Oil, Acids, Alkalis, Solvents and Steam

SUBSTANTIAL plant additions increasing the capacity of PELLETEX production by 20,000,000 pounds annually, will enable us to serve your post-war needs more promptly. Bear in mind that GASTEX and PELLETEX are produced in two States on different railroads, and served by separate gas fields.

HERRON BROS. & MEYER

OHIO BLDG., AKRON, OHIO.

GENERAL SALES AGENTS FOR

GENERAL ATLAS CARBON

GASTEX TRADE MARK

PELLETEX TRADE MARK

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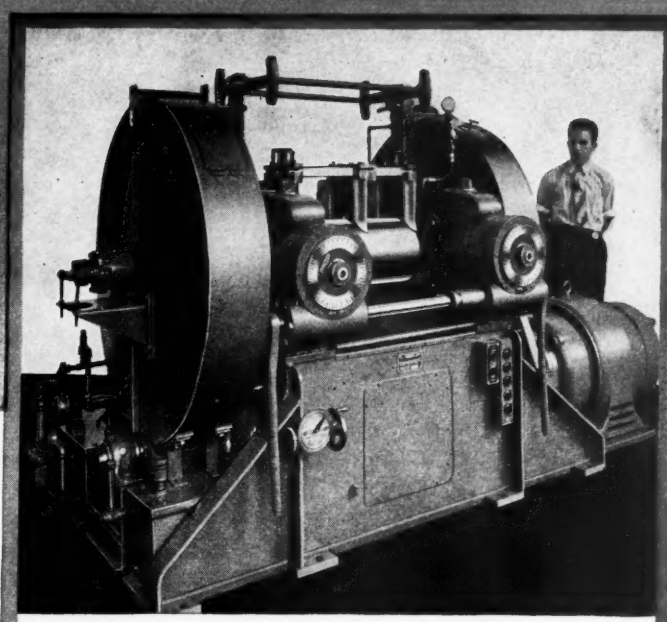
H. M. ROYAL, INC., Trenton, N. J.
ST. LAWRENCE CHEMICAL CO., LTD., Toronto - Montreal

What is the main "point" in a LABORATORY MILL?



A mill for use in a laboratory must be a versatile piece of equipment . . . a machine that can be used for a certain series of tests or experiments today, and for a totally different purpose tomorrow or the week after.

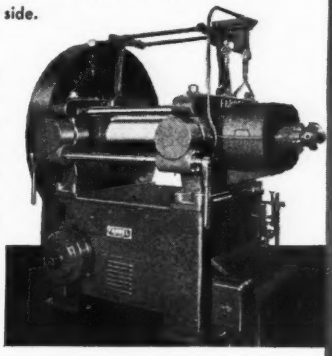
For this reason, we ask each purchaser to tell us what he wants to accomplish, so that we can furnish a mill built to meet his individual requirements. This may be a standard mill, a modification of a standard mill, or an entirely new design ...depending on the job to be done. Three examples of laboratory mills, "designed for the job," are illustrated on this page.

Before you decide on a laboratory mill, we suggest you ask our engineers for recommendations and get the benefit of their experience.

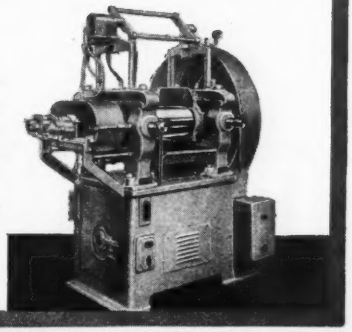
FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N.Y.
Sales Offices: Ansonia, Buffalo, New York, Pittsburgh, Akron, Los Angeles

1 12" x 26" double-geared mill driven by a four-speed, AC motor through a speed changer which provides infinitely adjustable roll friction from even motion to 2:1 friction. A worm and ratchet mechanism facilitates adjustment of the front roll, and vernier indicators show amount of roll movement. Removable center guide, adjustable along the roll face, makes milling of varying size batches easier. Hand-operated scraper can be changed from front to back roll. Push-button control on both sides of mill permits operation from either side.



2 10" x 24" mill mounted on welded base which provides convenient working height. The DC, adjustable-speed, geared motor drive is housed in the base. A worm and ratchet device with clutch permits synchronized adjustment of both ends of front roll or either end separately. Knives are provided for trimming edges of the stock. A take-off roll, mounted between the housings, facilitates stock removal.



3 8"x16" mill with geared motor drive enclosed in high base of welded construction. This arrangement conserves floor space and provides ready access to the mill from all sides.

Farrel-Birmingham

Short of Mixing Capacity?

IF you are short of mixing capacity, have you utilized the value of RECLAIM in increasing your volume of mixing, while still maintaining quality?

We will be glad to discuss the matter with you.

PEQUANOC RUBBER CO.

QUALITY RECLAIMS FOR SPECIFIC PURPOSES

BUTLER NEW JERSEY

SALES REPRESENTATIVES

Harold P. Fuller
31 St. James Avenue
Boston, Mass.

Burnett & Co. (London) Ltd.
46 Herga Court
Harrow-on-Hill, Middlesex, England

Sharples Announces the VULTACS

A New Series of Vulcanizing Agents for GR-S and other Synthetic Rubbers

The VULTACS are a class of readily soluble organic sulfur compounds, which provide a new and effective means of achieving truly uniform vulcanization, resulting in:

- . . Unusual resistance to flex-cracking and tear.
- . . Outstanding retention of tensile strength and elongation upon aging.
- . . Lessening of "Marching Modulus" upon aging.

In addition, these new materials impart to uncured stocks:

- . . Easy processing characteristics.
- . . Improved pigment dispersion.
- . . Effective tack to GR-S formulations.

Three modifications of the VULTACS* based on *p-tert*-amylphenol are now available in commercial quantities:

	VULTAC #1	VULTAC #2	VULTAC #3
Derivative of *p-tert*-Amylphenol	Monosulfide[a]	Disulfide[b]	Disulfide[c]
Sulfur content	13%	23%	28%
Color and form	Soft Brown Resin	Hard Brown Resin	Hard Brown Resin
Softening point	45-55°C.	55-65°C.	70-80°C.
Specific Gravity 25/25°C.	1.11-1.12	1.16-1.17	1.19-1.20
Recommended Use	General Purpose Vulcanizing Tackifier	Primary Vulcanizing Agent for GR-S	Primary Vulcanizing Agent for Buna N polymers
Recommended Proportion	10-25 parts PHR with decreased sulfur	6-10 parts PHR	5-9 parts PHR

*Formerly offered as Sharples Vulcanizing Tackifiers:
[a] XP-35
[b] XP-164
[c] XP-171

Literature and samples on request

Please address all inquiries to Sharples Chemicals Inc., Development Department, 123 South Broad St., Philadelphia 9, Pa.

SHARPLES TRADE MARK CHEMICALS

SHARPLES CHEMICALS INC.

PHILADELPHIA CHICAGO NEW YORK

DETROIT PUBLIC LIBRARY

Good for Another 30,000 Miles?

SURE the tire is smooth. But if it hasn't been abused in service, it's good for 2 or 3 recap jobs. With reasonable care, by holding down driving speeds, by easy starting and stopping, and maintaining correct air pressures, it can deliver double the mileage for which it was originally intended.

You can thank America's skilled tire engineers for this doubling of tire life. For it is more than just a matter of recapping materials and application.

In your prewar tires, rubber company engineers, designed and built in *extra* quality and safety in sidewalls, the inner cords (carcass) and the bead. It is only because these constructions have generally stood up that it's possible for millions of motorists to continue driving with 4 and 5 year and even older tires.

Bead construction might have been made cheaper, but tire manufacturers purposely set high standards of workmanship and specified high quality steel wire for bead making.

And close collaboration between rubber engineers and National-Standard has resulted in reducing bead failures to a minimum.

Since the early days of the rubber industry, National-Standard has pioneered the development of better wire, improved wire construction and the design and building of wire applying machinery to improve and speed up production.

National-Standard's long experience naturally lead to the development of special wire for the improved service and longer life of many other rubber products, including many types of flexible hose, V-belts, conveyor belts, aircraft ignition cable shielding, and coverings for electrical cables.

National-Standard's engineering and research staffs are working on new uses and constructions of wire to improve scores of other products. Perhaps these developments can benefit your products—why not write and find out?

BACK THE ATTACK —BUY MORE WAR BONDS

NATIONAL STANDARD *Company*

Divisions of National-Standard Company

NATIONAL-STANDARD
Niles, Mich.
TIRE WIRE, FABRICATED BRAIDS AND TAPE

ATHENIA STEEL
Clifton, N. J.
COLD ROLLED, HIGH-CARBON SPRING STEEL

WAGNER LITHO MACHINERY
Hoboken, N. J.
LITHOGRAPHING AND SPECIAL MACHINERY

WORCESTER WIRE WORKS
Worcester, Mass.
ROUND STEEL WIRE, SMALL SIZES

KOSMOBILE
•
DIXIEDENSED

These finely divided high grade channel blacks guarantee cool mixing, easy processing and low heat buildup.

Every pound controlled, which insures maximum reinforcement and stamina for all rubbers.

Our Technical Service Division is ready at all times to assist you in your compounding problems.

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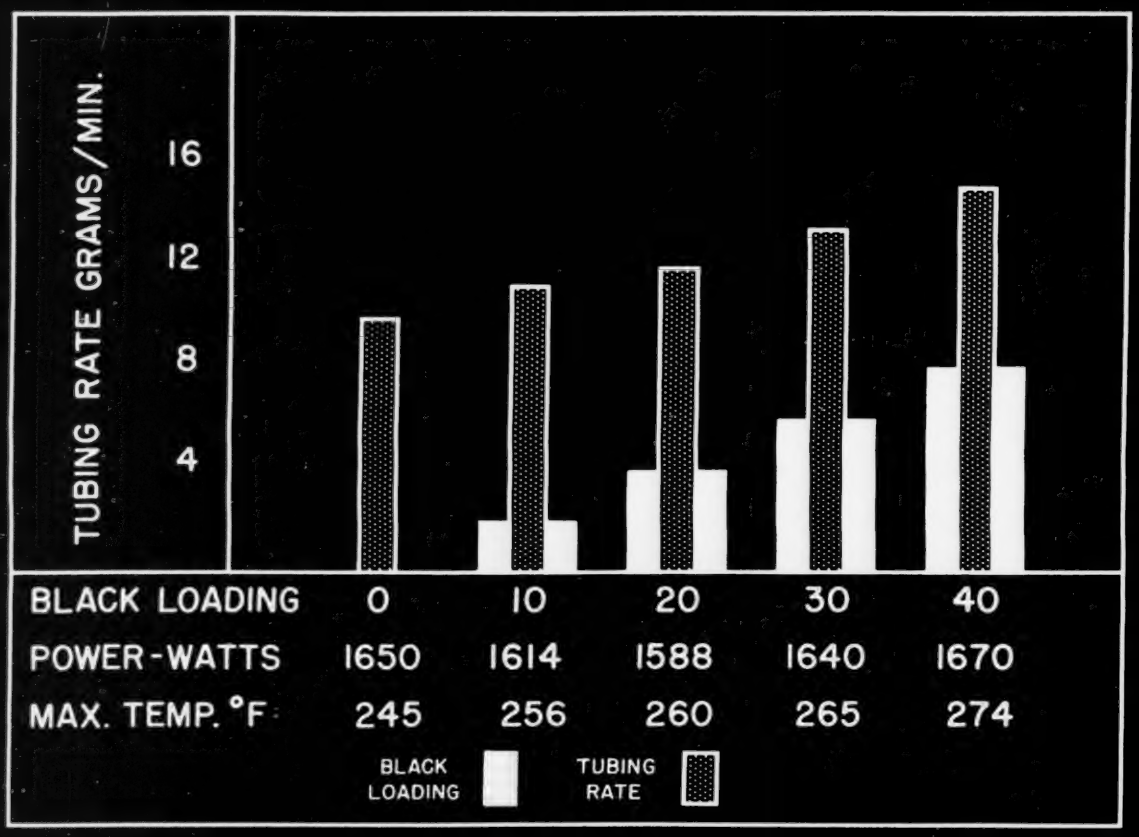
EFFECT OF DIXIEDENSED 77 KOSMOBILE 77 CHANNEL CARBON BLACK ON THE BREAKDOWN OF GR-S



DIXIEDENSED 77 – KOSMOBILE 77

Start with Dixiedensed 77—Kosmobile 77 as an aid in the breakdown and mastication of GR-S and thus save on milling time. Then use more of this finely divided high grade channel process black to provide the necessary reinforcement and stamina.

Dixiedensed 77—Kosmobile 77—the cool mixing, easy processing, high reinforcing and low heat generating black, outstanding for uniform quality and fine performance.

RESEARCH DIVISION

UNITED CARBON COMPANY, INC.

Charleston, West Virginia

HARDESTY CHEMICAL COMPANY

announces volume production of

PLASTICIZERS

that may be just the ones you're looking for

A study of these chemicals manufactured by Hardesty Chemical Company may suggest to you a possible use in solving your production problems.

• • •

SEBACIC ACID

Specific gravity	1.085 25/15°C
Melting point	128°C
Neutralization equivalent	102
Free fatty acid	98.5%
Moisture	0.15%
Mol. weight	202.14

BUTYL ROLEATE

Free fatty acid	2%
Butanol	0.2%
Moisture	0.2%
Color	Red

CAPRYL ALCOHOL

Specific gravity	0.815/20°C
Mol. weight	130.23
Flash point	172°F
Distillation range .	176.8/179.9°C
Refractive index	1.4266 @ 20°C
Lbs. per U. S. gallon	6.81
Boiling point	178/179°C
Moisture	0.25%

DIBUTYL SEBACATE

Purity	98.5% Minimum
Specific gravity	0.935 20/20°C
Acidity as Sebacic	0.3% Maximum
Color	15Y, 3.5R
Butanol	0.1% Maximum
Flash point	380°F
Boiling point	344°C @ 760 mm. 175-180°C @ 3 mm.
Water solubility	Less than 1% @ 25°C
Freezing point	11°F
Weight per gallon	7.8 lbs.
Index of refraction	1.4391 @ 25°C
Dielectric constant	3.6
Power factor—60 cycles	6

• • •

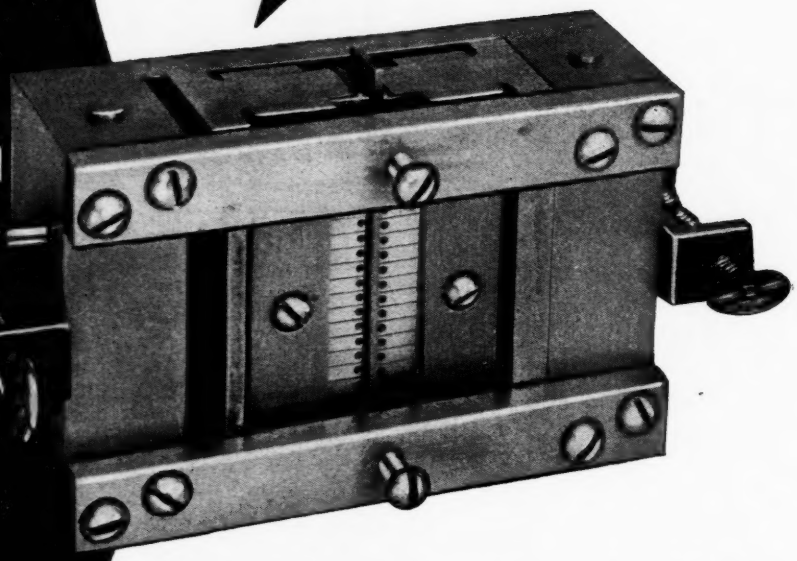
Send for samples and additional information

HARCHEM

HARDESTY Chemical Company, Inc.

41 EAST 42nd STREET • NEW YORK 17, N. Y.

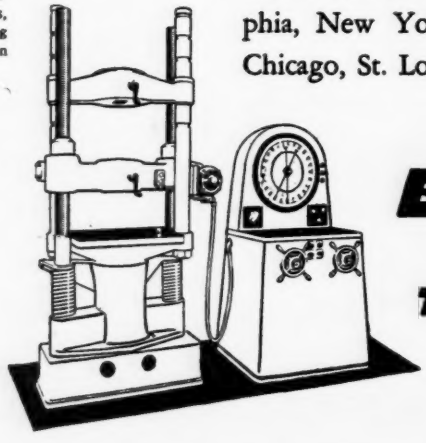
Here's a new jig that simplifies compression testing of sheet material



This simple inexpensive new jig speeds and facilitates the direct determination of compression yield strength of a single sheet of material. Sheet is restrained from lateral deflection by a number of small rollers. Extensometers are attached to the edge of the sheet. A real time-, trouble- and labor-saver for your laboratory The Baldwin Locomotive Works, Baldwin Southwark Division, Philadelphia, Pa., U.S.A. Offices: Philadelphia, New York, Washington, Boston, Cleveland, Chicago, St. Louis, Houston, San Francisco.

BALDWIN PRODUCTS

Hydraulic presses, Testing equipment, Steel forgings and castings, Diesel-electric locomotives, Diesel engines, Metal plate fabrication, Rolled steel rings, Bronze castings, Heavy machine work, Crane wheels, Bending rolls, Plate planers, Babbitt metal, Alloy iron castings, Briquetting presses.



BALDWIN

SOUTHWARK

TESTING EQUIPMENT

THE BALDWIN GROUP

Technical Bulletin No. 3

on the compounding of GR-S with Substantial Loadings of Zinc Oxide

Results with Benzothiazyldisulfide Accelerations

SOMEWHAT higher tensiles are realized with this compound than with those previously reported. The resilience properties are better than Compound No. 1 and the heat generation and cut-growth are low.

COMPOUND NO. 3	
GR-S	100.0
Sulfur	3.0
Benzothiazyldisulfide	2.0
E.L.C. Magnesia	5.0
Cumar MH2 ½	7.5
Zinc Oxide	100.0

ORIGINAL RESULTS

Time of Cure Min. at 45 Lb.	Tensile Strength Lb./Sq. In.	Percent Elongation	Load (Lb./Sq. In.) For Elongation of			Permanent Set
			200%	300%	400%	
7.5	1370	670	195	235	315	.23
15	1740	670	200	275	395	.27
30	1255	560	235	350	510	.18
45	1650	610	235	315	470	.24
60	1050	530	240	320	485	.14
90	1240	575	200	280	440	.17

Time of Cure Min. at 45 Lb.	Shore Hardness	Goodyear-Healey Pendulum		Compression Fatigue (Goodrich Flexometer)*					Cut-Growth Resistance Inches—Failure at	
		Indentation in mm.	Per Cent Rebound	Per Cent Initial Comp.	Running Time and Per Cent Permanent Set	Max. Temp. Rise °C.	Dynamic Compression		4,000 Cyc.	13,000 Cyc.
							Initial	Final		
90	48	8.30	61.2	23.4	15′— 3.6	14.2	14.2	17.0	.14	.38

*Test Conditions: 100 Lb. Load. 0.15″ Stroke. 100°C. Oven Temp.

The tear resistance of Zinc Oxide compounds on the original specimen tested at both room temperature and 100°C. is much lower than might be anticipated from the natural rubber analogy. This subject is receiving special attention and will be reported on later.

THE NEW JERSEY ZINC COMPANY
160 FRONT STREET • NEW YORK 7, N.Y.
Products Distributed by THE NEW JERSEY ZINC SALES COMPANY
NEW YORK • CHICAGO • BOSTON • CLEVELAND • SAN FRANCISCO

Consult the **UBS** *Laboratories on special Bonding, Coating and Impregnating Problems!*

No matter what the problem may be — *bonding neoprene, rubber and other coated or moulded parts to any ferrous or non ferrous metal; corrosion proofing chemical tanks and equipment; laminating leather belting; coating magneto parts; combining or coating fabrics; impregnating paper; cementing various materials together; insulating wire and other articles; etc.* — you will find the UBS Laboratories equipped to provide the one best formula to suit your needs. Longtime specialists in the field of industrial Bonding, Coating, and Impregnating Compounds, the UBS Laboratories not only know thoroughly the compounding advantages and limitations of all the latest synthetics, but even have developed an original synthetic latex and synthetic rubber of their own. *Write today, describing your Bonding, Coating, or Impregnating Problems.*

UBS developed adhesives are being used in the manufacture of inflatable Army and Navy Equipment, where weather and chemical resistant seams of high tensile strength are required.

UBS developed compounds are being successfully used to coat magneto parts and for cementing gaskets, where oil resistance is of great importance.

UBS developed adhesives and coating compounds are being widely used on Army delousing bags, protective clothing, etc., where acid resistance and flame resistance are of paramount importance.

UBS developed compounds are being used for chemical tank linings and to corrosion proof chemical handling equipment, where acid resistance and alkali resistance are primary factors.

Address all inquiries to the Union Bay State Chemical Company, Rubber Chemicals Division, 50 Harvard Street, Cambridge 42, Massachusetts.

UBS

UNION BAY STATE *Chemical Company*

Serving Industry with Creative Chemistry

ORGANIC CHEMICALS · SYNTHETIC LATEX · SYNTHETIC RUBBER
PLASTICS · INDUSTRIAL ADHESIVES · DISPERSIONS
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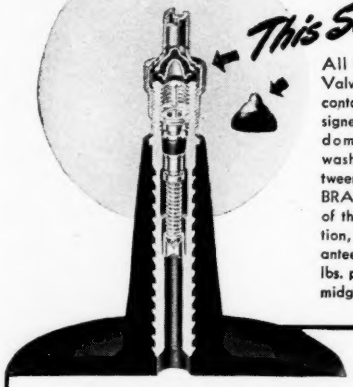
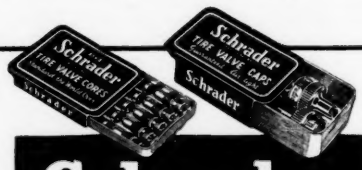
THIS?



All Standard Schrader Valve Caps in use today contain the specially designed sealing unit with a dome-shaped rubber washer vulcanized between two dome-shaped BRASS plates. Because of their unique construction, these caps are guaranteed airtight up to 250 lbs. pressure. This mighty midget does the work.

MR. & MRS. AMERICA

Today good tires need good care—poor tires demand it. For safety and a minimum of tire trouble, keep a watchful eye on your tires now and be sure a Schrader Cap is applied firmly to each tire valve.



Schrader
CONTROLS THE AIR

What would you do if your tires wore out and you couldn't get replacements—Use oxen? Certainly not! But they would be better than nothing. So, with new tires for all admittedly remote, why not take care of your present ones? Isn't that just good sense?

What single factor ruins most tires? Underinflation. It breaks down side walls and causes a serious loss of tire mileage. Yet underinflation can easily be prevented.

What to do about it? Take air-pressure reading with an accurate gauge. Put air in when needed and seal that air in at the valve mouth with an airtight Schrader Valve Cap. Be sure there's a Schrader Cap, screwed down fingertight on every tire, including the spare.

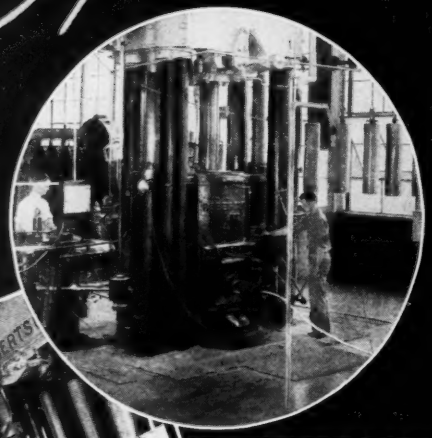
Uncle Sam, too, realizing the importance of Standard Caps is using them on *all* pneumatic tired vehicles at home and abroad. So take care of those you have. Be sure they're on tight. And if your dealer is temporarily out of Schrader Caps, don't blame him. Try again later.

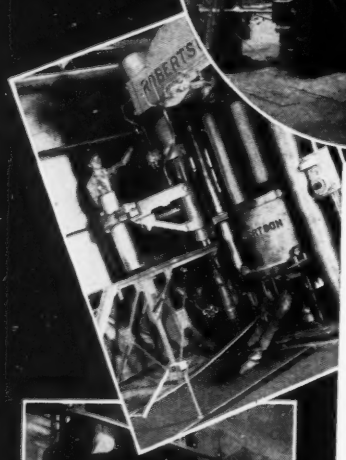
CAPS are vital for TIRE CONSERVATION

A. SCHRADER'S SON, *Division of Scovill Manufacturing Company, Incorporated,* BROOKLYN, NEW YORK

Exclusively

JOHN Robertson
COMPANY, INCORPORATED
125-135 WATER STREET, BROOKLYN 1, NEW YORK





It is a privilege for us to list the following widely known and representative firms, who are users of ROBERTSON LEAD ENCASING PRESSES AND LEAD ENCASING DIE-BLOCKS—*"EXCLUSIVELY:"*

National Electric Products Corp.
Crescent Insulated Wire & Cable Co.
Home Rubber Co.
John A. Roebling's Sons Co.
Phelps Dodge Corp.
Anaconda Wire & Cable Co. Marion plant
Paranite Wire & Cable Co.
The DeVilbiss Co.
Kerite Insulated Wire & Cable Co.
United States Rubber Co.
Rome Cable Company
The B. F. Goodrich Co.
Swan Rubber Co.
Triangle Wire & Cable Co.
Circle Wire & Cable Co.
The Okonite Co.
Okonite-Callender Cable Co.
Hazard Insulated Wire Works
Thermoid Co.
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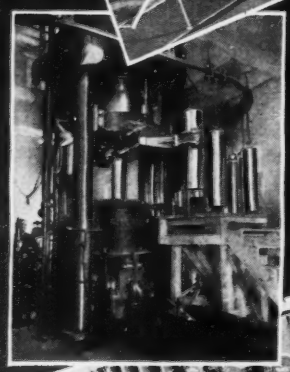
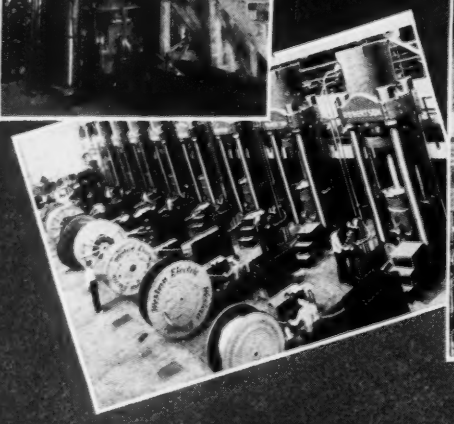
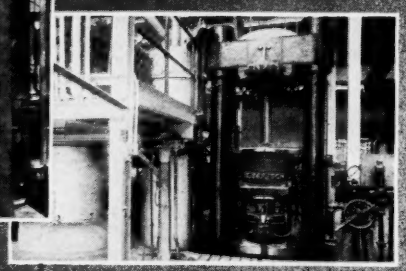
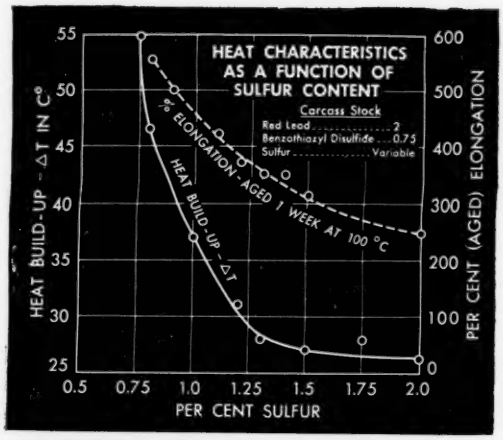
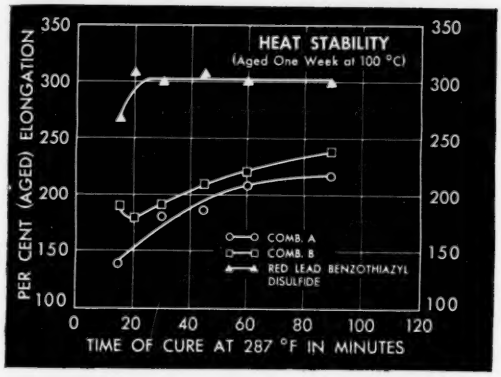
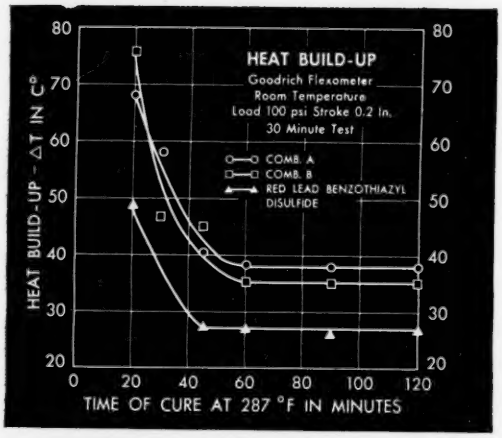


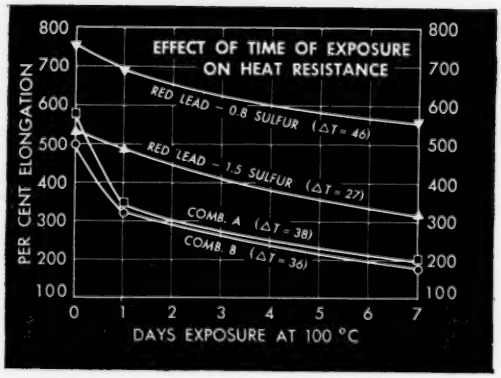





HEAT CHARACTERISTICS AS A FUNCTION OF SULFUR CONTENT
Carcass Stock
Red Lead 2
Benzothiazyl Disulfide 0.75
Sulfur ..... Variable
% ELONGATION - AGED 1 WEEK AT 100 °C
HEAT BUILD-UP - ΔT
HEAT BUILD-UP - ΔT IN C°
PER CENT (AGED) ELONGATION
PER CENT SULFUR


HEAT STABILITY
(Aged One Week at 100 °C)
COMB. A
COMB. B
RED LEAD BENZOTHIAZYL DISULFIDE
PER CENT (AGED) ELONGATION
TIME OF CURE AT 287 °F IN MINUTES




EFFECT OF TIME OF EXPOSURE ON HEAT RESISTANCE
RED LEAD - 0.8 SULFUR (ΔT = 46)
RED LEAD - 1.5 SULFUR (ΔT = 27)
COMB. A (ΔT = 38)
COMB. B (ΔT = 36)
PER CENT ELONGATION
DAYS EXPOSURE AT 100 °C

Heat build-up and heat stability . . . both improve when you compound GR-S with RED LEAD

Have you had difficulty making your GR-S carcass stocks both heat resistant and cool running?

If so, try the right combination of red lead, benzothiazyl disulfide and sulfur.

Its acceleration is sufficiently active and efficient to provide—concurrently—heat stability and low heat build-up.

Note the following table and the accompanying charts.

FORMULA

GR-S (Institute)	100
S.R.F. Black	30
Zinc Oxide	3.0
Paraflux	7.5
No. 2 R.M. Red Lead	2.0
Benzothiazyl Disulfide	0.75
Sulfur	1.5

Physical Properties

T/287° F.	Tensile Strength	% Elong.	T-300	Shore	ΔT° in C°
15	1520	860	315	....	....
20	1630	780	390	46	49
30	1450	630	520	47	47
45	1330	530	570	47	27.5
60	1210	480	520	47	27
90	1130	500	590	47	26
120	1100	500	610	47	28

	Aged One Week at 100° C.			Aged 48 Hours at 100° C.	
T/287° F.	Tensile Strength	% Elong.	T-300	Shore	ΔT° in C°
15	910	270	.....	....	....
20	1080	320	1000	54	30.5
30	990	300	990	54	30.5
45	1050	310	1000	53	29.5
60	1130	300	1090	53	26
90	1090	300	1090	53	25
120	1160	340	1100	53	25

° Goodrich Flexometer operated at room temperature. 30 minute tests. Load 100 psi, stroke 20%.

SUMMARY OF ADVANTAGES

1. Imparts improved heat resistance—retention of elasticity.
2. Imparts improved heat build-up—cooler running.
3. Relatively faster curing rate.
4. Safe processing.
5. Excellent general physical properties.
6. Broad curing plateau—very little change in properties on overcures.
7. Economical.
8. Available.

The charts illustrated are taken from a report on recent experimental work by the Rubber Division of our Research Laboratories on the problem of heat build-up and heat stability in GR-S stocks. Write for your copy. The report is titled, "The Heat Problem in GR-S Carcass Stocks."

NATIONAL LEAD COMPANY New York, Buffalo, Chicago, Cincinnati, Cleveland, St. Louis, San Francisco; Boston (National-Boston Lead Co.); Pittsburgh (National Lead & Oil Co. of Penna.); Philadelphia (John T. Lewis & Bros. Co.).

MAKING A NEW WORLD

"One World"—says Mr. Willkie . . . and a changed world. One vast city. A new world . . . conjured up by chemists . . . today's miracle men. Keep close to chemists and you'll keep contact with progress. They hold the keys of tomorrow.

Today's laboratories are vibrant with change. The chemists are startled by their own discoveries. No man dares predict tomorrow's revelations.

Coatings share in this forward plunge. What of your product? What was tops yesterday will be . . . should be . . . scrapped tomorrow. Your one right formula may now lie latent in our laboratory. It will cost less . . . or save time . . . or improve appearance . . . or increase salability. Write us. It involves no obligation. Address the Stanley Chemical Company . . . manufacturers of Stanley Lacquers, Enamels, Synthetics and Japans . . . East Berlin, Connecticut.

Stanley Chemical

TR-11

A NEW LOW-COST NEUTRAL PLASTICIZER AND EXTENDER FOR GR-S

TYPICAL FORMULATION

GR-S	100
Zinc Oxide	5
EPC Black	100
TR-11	45
Stearic Acid	2
Sulfur	3
MBT	1.50
DPG	.25

CURE 50 MINUTES AT 298° F

Properties	Original	Aged 24 hrs. at 212° F
Duro	70	78
Tensile	2000	1930
Elongation	600	450
300% Modulus	970	1500

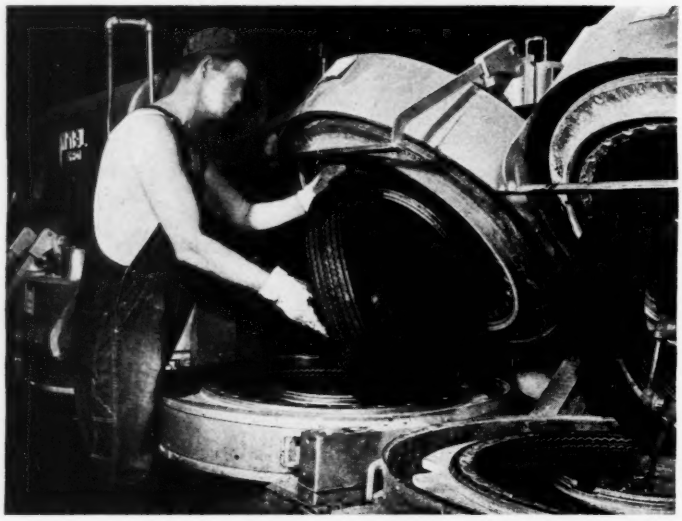
Now available through

THIOKOL CORPORATION, TRENTON 7, N. J.

Manufacturers of Thiokol* Synthetic Rubber and Rubber Chemicals

*Thiokol Corporation Trademark Reg. U. S. Pat. Off.

McNEIL—AKRON



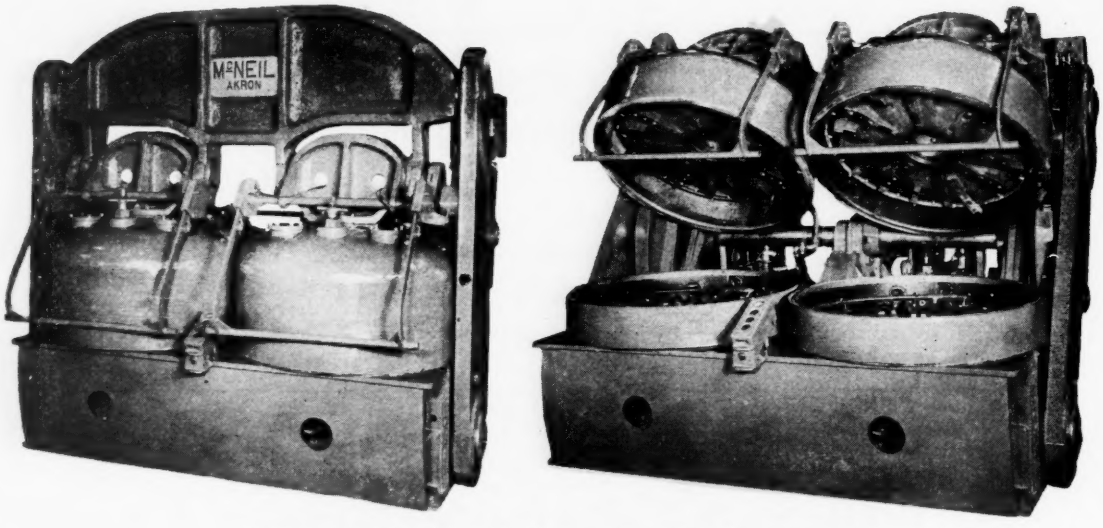
FOR CURING SYNTHETIC TIRES AND TUBES

A Synthetic Rubber Tire Being Taken from an Early Model McNeil Twin Automatic Vulcanizer

In the production of synthetic tires and tubes, McNeil individual vulcanizers are answering every demand for complete satisfaction.

New and improved models are being installed as rapidly as possible in the leading tire plants.

We are pioneers in the production of electrically-operated automatic tire and tube curing presses.



Latest Model McNeil Twin Steam Dome Tire Curing Press

THE McNEIL MACHINE & ENGINEERING CO.

96 EAST CROSIER ST. AKRON 11, OHIO

Light... AND UNIFORM IN QUALITY

That's why leading Neoprene Compounders demand

K&M LIGHT MAGNESIUM OXIDE

Available Now!

You can judge a product's performance by the repeat demands it receives. And repeat demands for K&M Light Magnesium Oxide pour in daily from leading Neoprene Compounders.

Keasbey & Mattison have expanded their facilities—are operating 24 hours a day—to give you immediate service. You can rely on Keasbey & Mattison Light Magnesium Oxide for uniform lightness, uniform quality, uniform dispersion . . . always dependable performance.

Our Ambler plants proudly fly the Army-Navy "E" flag with its Star — an honor awarded K&M employees "for continued outstanding production of war materials."

KEASBEY & MATTISON
COMPANY, AMBLER, PENNSYLVANIA

One of America's oldest and most reliable makers of asbestos and magnesia products. Founded 1873

OUR DISTRIBUTOR OF K&M LIGHT MAGNESIUM OXIDE IS:

AMERICAN CYANAMID & CHEMICAL CORPORATION

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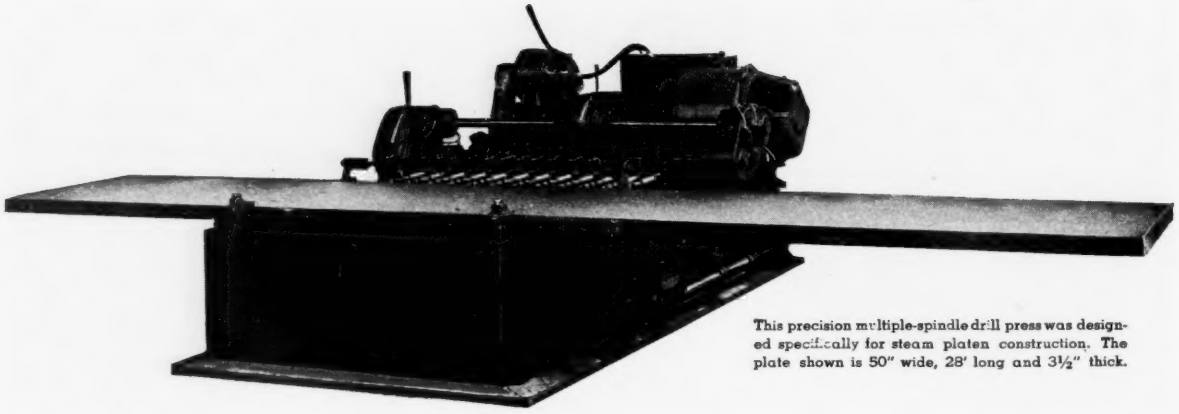
3 Reasons why

R. D. WOOD STEAM PLATENS

are trouble-free . . .



This precision multiple-spindle drill press was designed specifically for steam platen construction. The plate shown is 50" wide, 28' long and 3½" thick.

1. UNIFORM HEAT DISTRIBUTION . . .

holes are drilled on a special horizontal multiple-spindle drill press that insures straightness, accurate center line location and uniform spacing.

2. ACCURATELY-MACHINED SURFACES . . .

plate thicknesses are uniform throughout the entire plate area. Surface can be finished as required from ordinary smooth tool finish to a highly polished surface.

3. PERMANENTLY STEAM-TIGHT . . .

welded plug construction eliminates the need for threaded joints. Prevents leakage under even the most severe operating conditions.

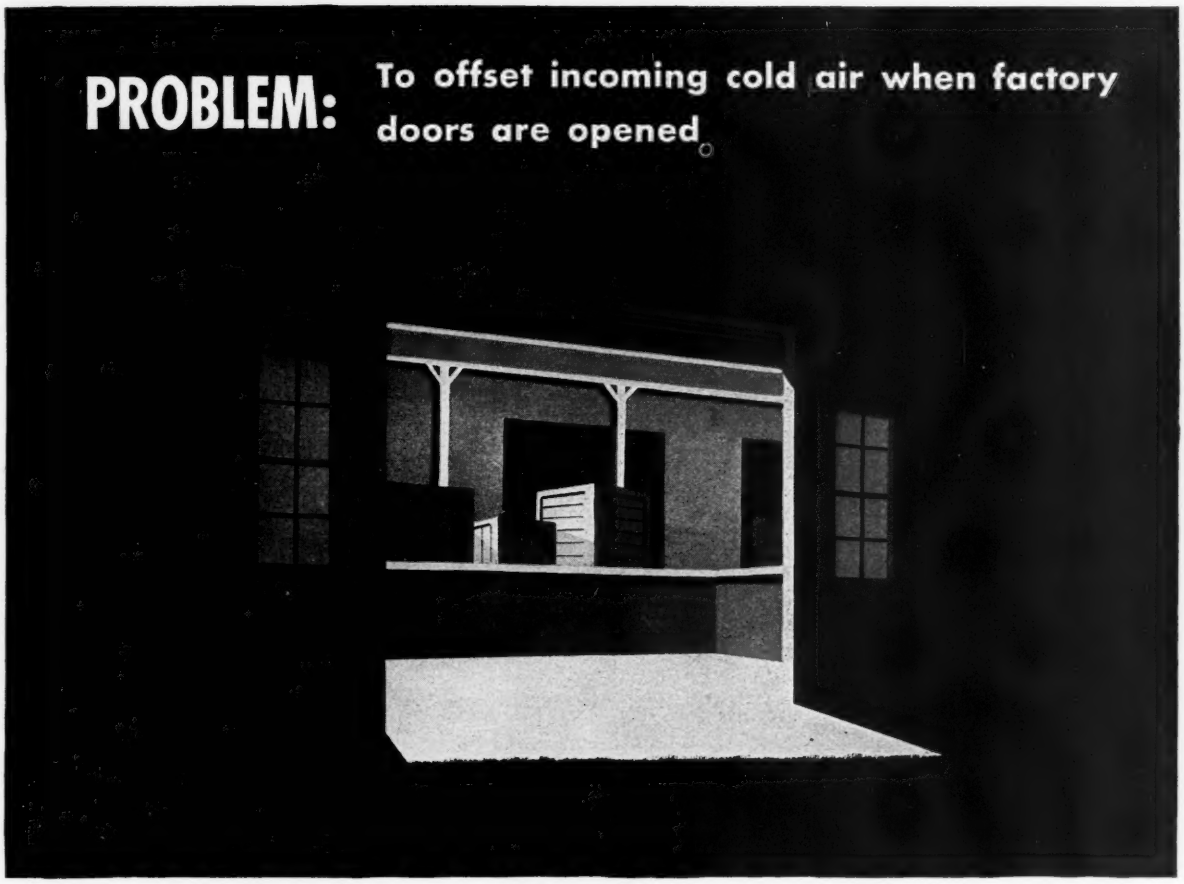
If you have need for steam platens or hot plates of any size, shape or thickness, it will pay you to consult with R. D. WOOD engineers. Our facilities for and experience in steam platen construction covers the rubber, plastic, wallboard and many other fields. Write us today about your steam platen problems.

HYDRAULIC PRESSES AND VALVES FOR EVERY PURPOSE . . .

R. D. WOOD CO.

400 CHESTNUT ST. PHILADELPHIA 5, PA.

PROBLEM: To offset incoming cold air when factory doors are opened.



SOLUTION: **Blanket entrance automatically with hot air blasts from unit heater**

ALMOST EVERY FACTORY faces this cold-weather problem: When doors are opened, a blast of cold air chills a large area of working space.

Many of America's largest plants have adopted this practical solution: A Carrier Unit Heater is installed at each entrance with its motor controls connected to the door. When the door opens the Unit Heater starts automatically and blankets the opening with hot air; prevents entry of cold air. Heater switches off automatically when door closes.

It's a simple solution, isn't it? Economical, too.

Of course not all heating problems can be solved so easily, but they can be solved — and Carrier engineers, with long experience in designing equipment for industrial heating, can help you find practical solutions of your problems.

Carrier's complete line includes units for high or low pressure steam or hot water . . . floor mounted or ceiling-suspended. All types are available, ***now with copper coils,*** in sizes to meet your exact requirements. Manual or thermostatic controls available. Whether you need one unit for a factory entrance, or hundreds of units for a plant, get the benefit of Carrier's long experience when you buy.

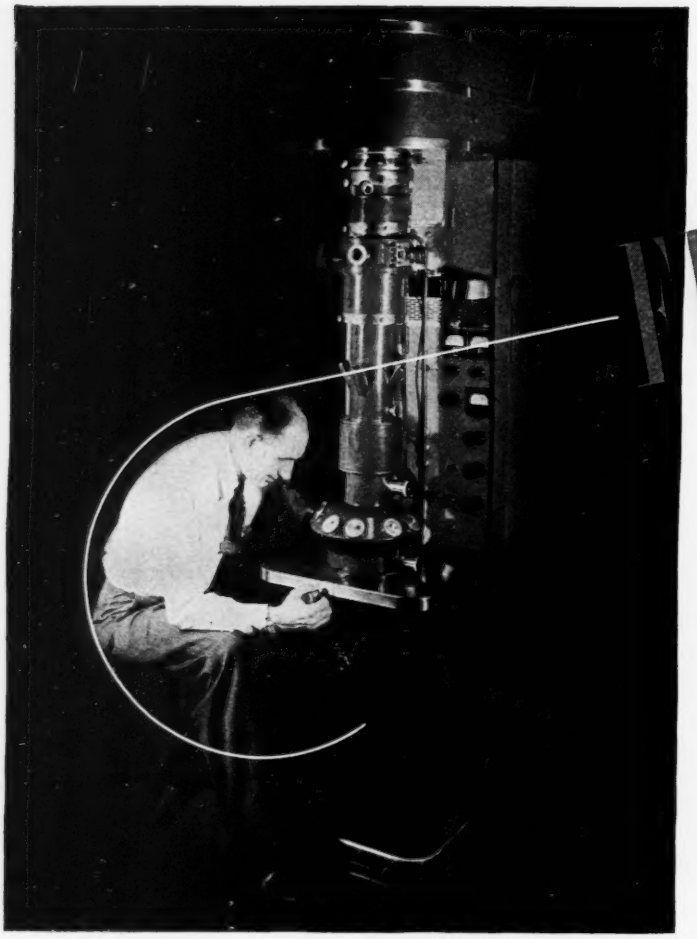
CARRIER CORPORATION, Syracuse 1, N. Y.

Carrier

ARMY E NAVY

AIR CONDITIONING • REFRIGERATION

FORTY-TWO YEARS EXPERIENCE IN INDUSTRIAL INSTALLATIONS



FINENESS—

IMPORTANT IN SYNTHETICS, TOO

Measuring the fineness of Aluminas under the electron microscope.

Alorco C-700 Aluminas disperse readily in natural rubber mixes, a property credited largely to the uniform fineness of these reinforcing pigments. This helps account for the greater volume of finished product obtainable from a fixed amount of crude, and for the easier manipulation of the stock.

Users of C-700 Alumina reinforcing pigments in synthetics report their similar behavior in these mixes. "They disperse readily," compounders say.

As you formulate new mixes, consider what this property of C-700 Alumina reinforcing pigments will do for you. We'll gladly provide you with samples meeting specific requirements for trial in your own plant. For these samples, write ALUMINUM COMPANY OF AMERICA, (*Sales Agent for* ALUMINUM ORE COMPANY) 1909 Gulf Building, Pittsburgh 19, Pennsylvania.

ALUMINUM ORE COMPANY

ALORCO

Aluminum and Fluorine Compounds

MT. VERNON FABRICS
ASSOCIATED WITH UNIFORM QUALITY FOR OVER HALF A CENTURY

...Roll Up Quality
Production With Quality Fabrics

Because the lasting quality of many of your products depends largely upon their fabric backing, the use of a good fabric not only leads to greater consumer satisfaction but aids you in rolling up bigger production. To this end a broad system of laboratory control guides every step in the production of MT. VERNON fabrics. In them you will find a degree of uniformity that is more likely to measure up to your own high standards and specifications. Specify MT. VERNON fabrics.

MT. VERNON WOODBERRY MILLS, INC.

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TWO GENERAL PURPOSE
GR-S COMPOUNDS
FOR ELECTRICAL INSULATION

	BLACK	WHITE
GR-S	100.	100.
Stearic Acid	0.75	0.75
ANTISOL*	4.	4.
AgeRite Resin D	3.	.....
AgeRite White	.....	0.75
Zinc Oxide	15.	35.
PELLETEX*	20.	.....
SILICAL*	100.	100.
DIELEX*	36.	.....
DIELEX ALBA*	.....	36.
Litharge	5.	.....
Benzothiazyl Disulfide	1.	1.
Selenac	1.	1.
Sulfur	2.	2.
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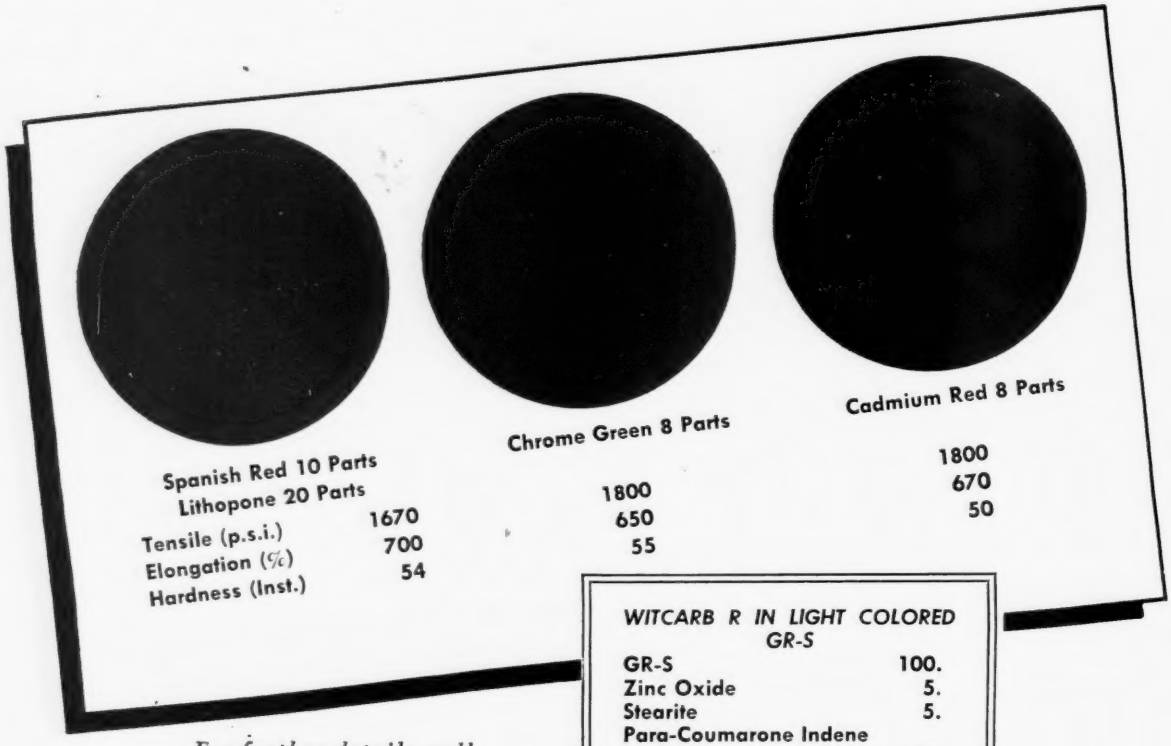

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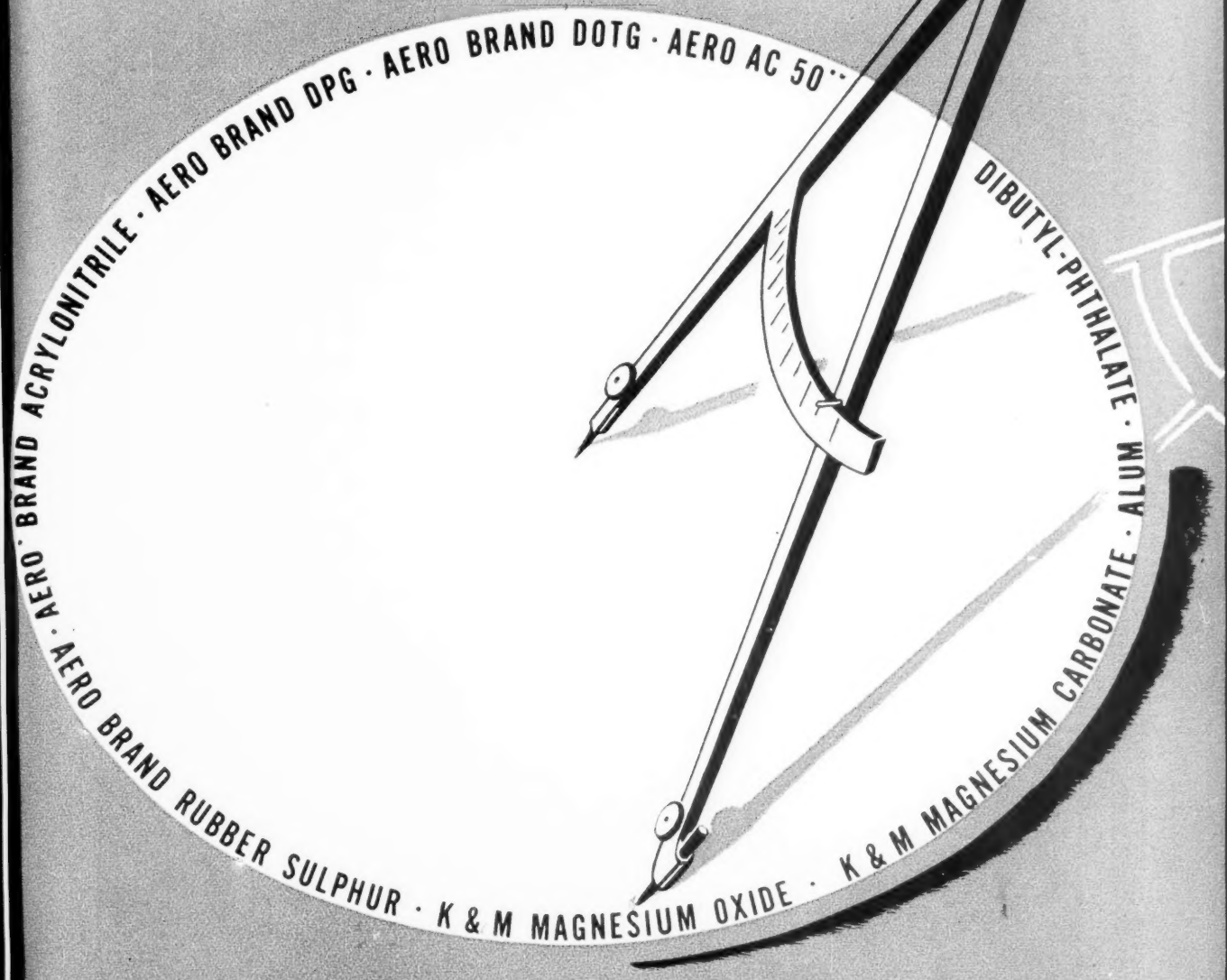
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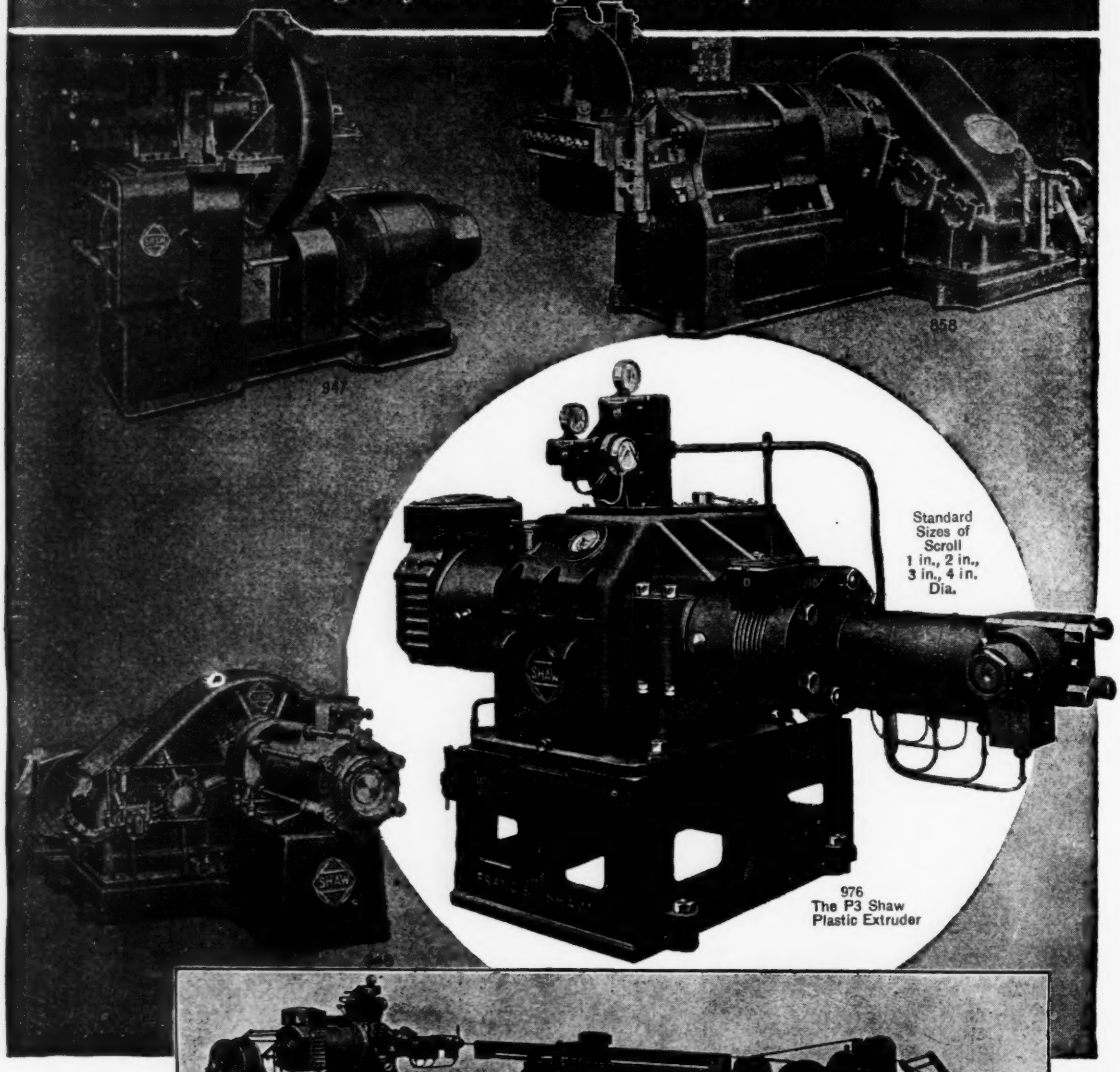

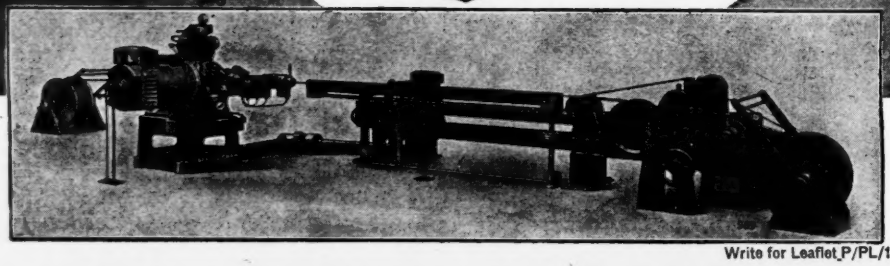

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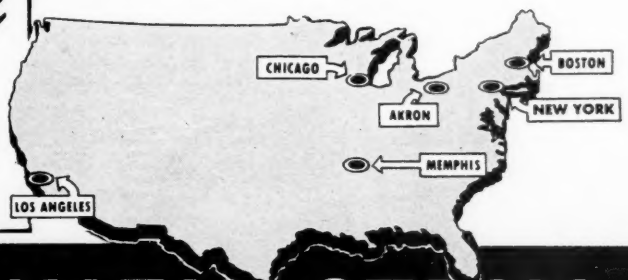

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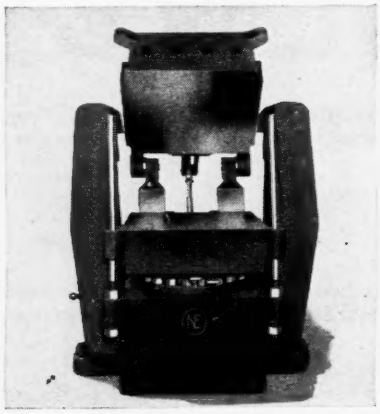

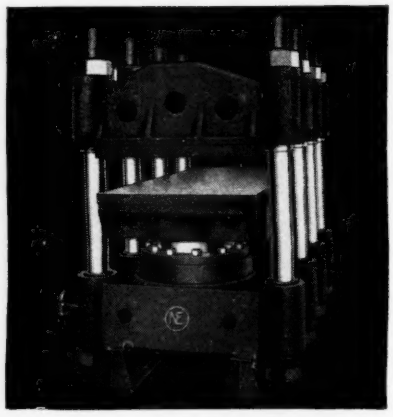

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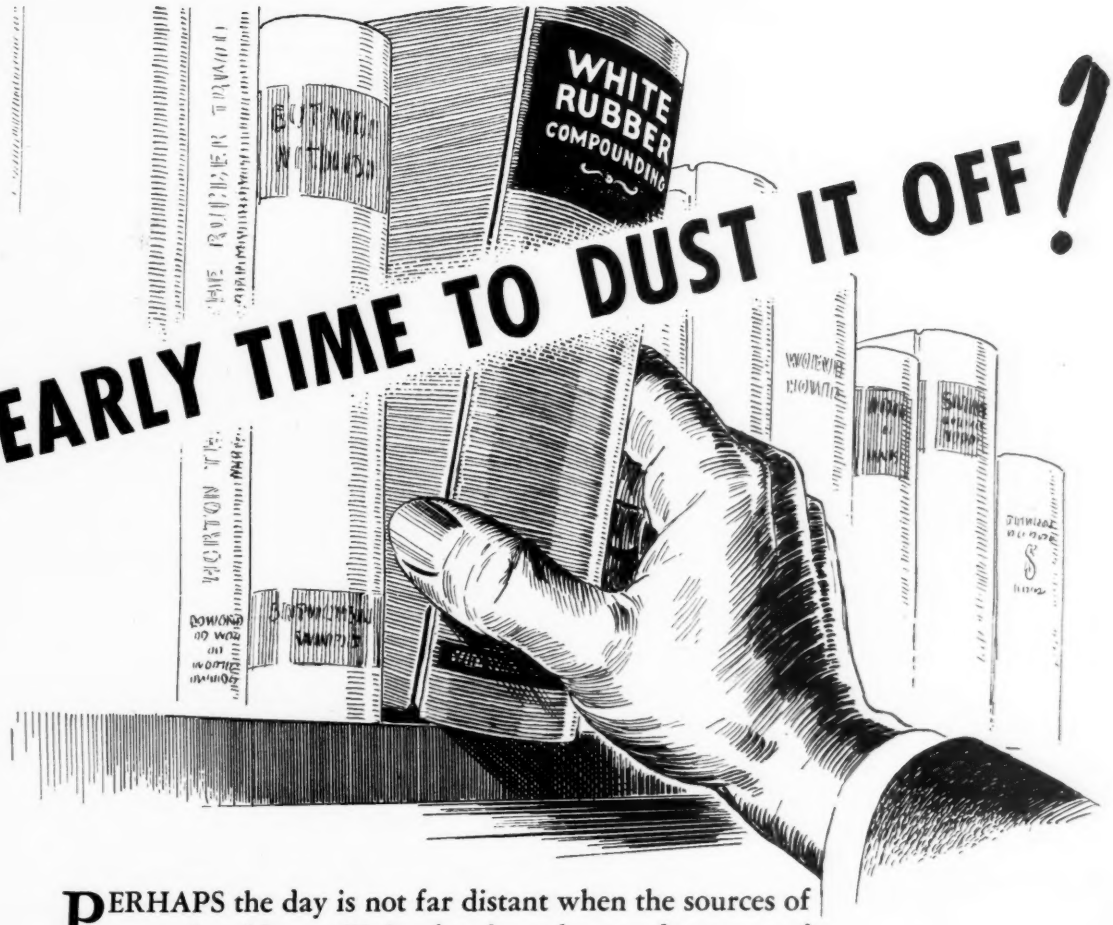

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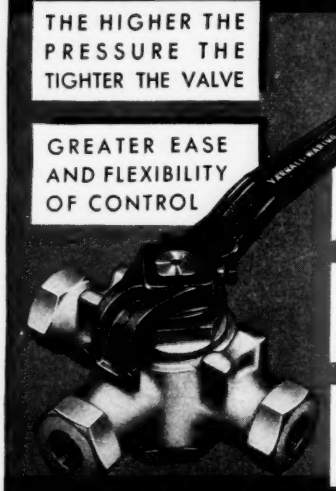

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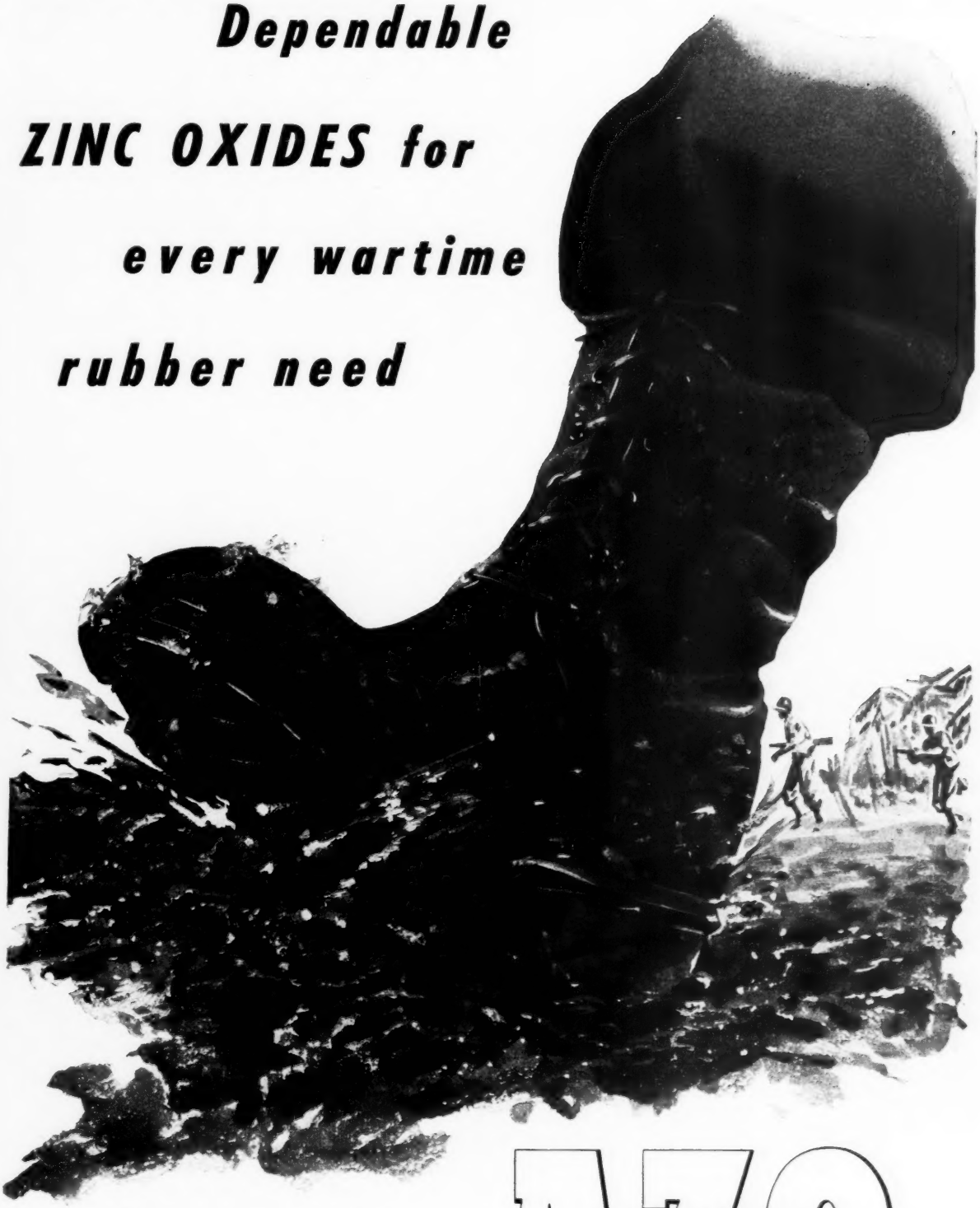

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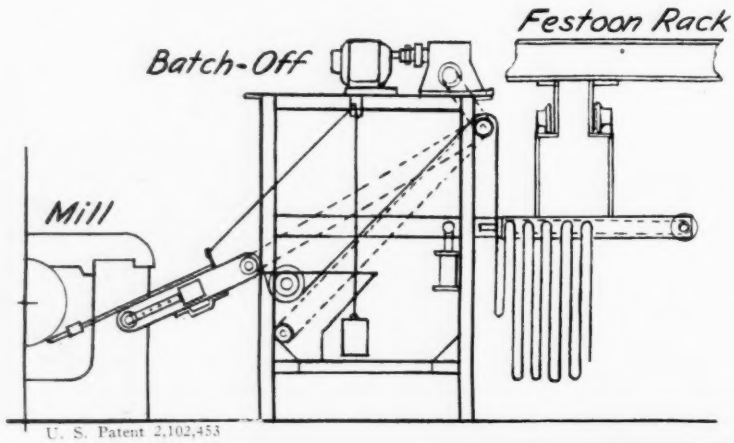

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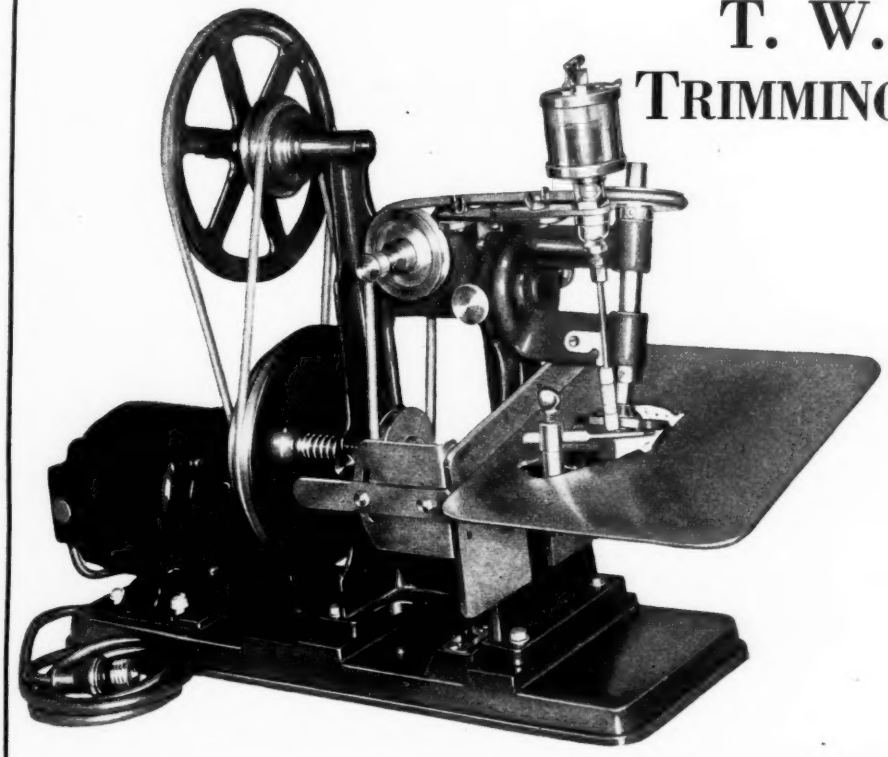

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Volume 111 **New York, October, 1944** **Number 1**

Softeners for GR-S—I

L. E. Ludwig,[1] D. V. Sarbach,[1] B. S. Garvey, Jr.,[1] and A. E. Juve[1]

THIS article presents the essential features of a comprehensive survey study of softeners for GR-S, involving some 650 materials, which was conducted in the laboratories of The B. F. Goodrich Co. during the past year. A report covering this project has been distributed through the Office of the Rubber Director to technologists of many of the rubber and chemical companies. In addition a paper on the subject of "Softeners" was presented by Dr. Garvey early in 1944 as part of the Engineering Science and Management War Training program offered by Yale University and New Haven Y. M. C. A. Junior College in New Haven, Conn., and a paper on "Softeners in Synthetic Rubbers" was also presented by Dr. Garvey at the Canadian Chemical Conference in Toronto in June, 1944. This present publication on "Softeners for GR-S" represents the latest revision on the subject as prepared by the authors especially for India Rubber World.

A survey of the effects produced by a wide variety of softeners in a single concentration and in a single GR-S recipe is given. The solvent relation of the softener to the GR-S is shown to indicate the general effects to be expected from its use. The materials tested have been classified into 16 fairly well-defined chemical classes, and the effects to be expected from representatives of each class have been outlined. A selection of softeners which will produce the greatest improvement in each of the physical properties of GR-S as well as those materials which will detract from the value of the original stock is included. Sufficient data were obtained to permit the selection of the most promising softeners for more extended studies on specific problems.

Because of its length, increased by the inclusion of the listing of the 650 materials tested, together with the names of suppliers wherever possible, the article will be presented in two or more installments. It is believed that the publication of this survey will be of considerable assistance to all rubber technologists and particularly to the many new workers who have entered or who will enter the field within the near future. EDITOR'S NOTE.

The term "softener" in the compounding of natural and synthetic rubbers is applied to a wide range of oils, tars, pitches, etc., which are used for a variety of reasons, some having little or no relation to softness. Since oils and tars were extensively used to soften high-grade crude rubber such as Para biscuit and smoked sheet and kill its nerve, it was only natural for those in the mill and compound rooms to call all materials of similar appearance or behavior "softeners."

With natural rubber such materials are used principally to improve milling, calendering, and tubing. There are, however, other uses. For example, palm oil may be used to prevent excessive sticking to the rolls during milling or calendering. Cumar or rosin may be used to get better sticking to the calender rolls and fabric during frictioning. Stearic acid or pine tar may be added to improve the dispersion of channel black. Mineral oil, factice, or tar may be used to give low durometer hardness in the cured product. Shellac may be used to combine good processing with high durometer hardness of the final product. Various tars and oils may be added to improve building tack. Yet all of these materials are commonly referred to as softeners.

In periods of scarcity or of high prices for rubber it was found that considerable quantities of some of these materials can be added to rubber compounds without excessive sacrifice of useful properties. Hence they were used as diluents or extenders. The distinction between a softener and an extender is arbitrary and not always consistent. The two terms are used for the same group of materials. If added in relatively small amounts for its specific effect on certain properties of the compound, the material is called a softener. The same material added in larger quantities to make the rubber go farther would be called an extender.

With the advent of synthetic rubbers it was found that many of the softeners used with natural rubber could be used with synthetic rubber for the same reasons. Synthetic rubbers are, in general, less tacky and more difficult to process than natural rubber so that these two basic reasons for the use of softeners assumed added importance. Because of differences in solubility relations, particularly with the oil resistant rubbers, it was necessary to extend the range of materials considered. Many materials such as the high boiling esters and ketones came into the picture. As compounding materials, they fitted readily into the softener classification.

Further, with synthetic rubber it was often found necessary to use considerably more softener than is the case with natural rubber to get the same effect on processing so that the effect on the final properties of the compound became more significant. It was found that the type and the amount of softener used may be a controlling influence on such properties as durometer hardness, modulus, tensile strength, rebound and hysteresis, freezing resistance, and degree of swell in oil. With synthetic rubber, softeners are selected as much for their effect on these final properties as for their effect on processing characteristics. Yet they are still

[1] With B. F. Goodrich Co., Akron, O.

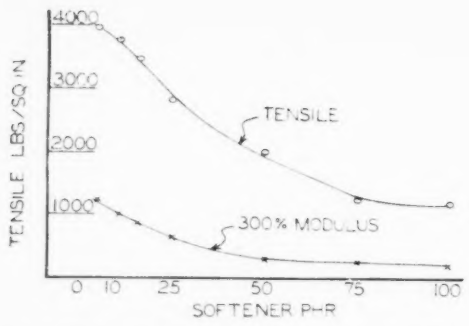

Fig. 1. Variation in Tensile and Modulus for Different Loadings of Cumar in Hycar Rubber

called softeners.

The breakdown of natural rubber on a mill has much the same effect on the processing characteristics as the addition of certain softeners. This breakdown is an oxidative degradation of the hydrocarbon brought about by the oxygen of the air under the conditions existing on mills and in Banburys and plasticators. It is accelerated by small amounts of such materials as hydrazines and thiophenols, which are consequently referred to as chemical softeners.

Fundamental Considerations

Having seen what we mean by the term "softener," let us consider some of the fundamental considerations in a study of softeners and how they have been applied in the laboratories of The B. F. Goodrich Co. to softeners for GR-S.

General experience, as well as systematic studies on other rubbers, has shown that both solubility relations and the physical properties of a material have a definite bearing on its use as a softener. Studies of these characteristics give a good preliminary picture of the types of materials which may be considered as softeners for a given rubber. Properly interpreted, they give much useful information and prevent much lost motion. They give only preliminary indications, however, and must be followed up by suitable compounding studies.

Solubility Relations

The mutual solubility relation between softener and rubber has a significant bearing both on processing characteristics and final properties. In the first place an insoluble material will not blend well with the batch and may even break up the rubber so that it cannot be mixed at all. If incorporated by special care or by a trick such as addition on the pigment, it will bleed out to give an oily surface, or, if a solid, it will remain dispersed much like a coarse, not-wettable pigment. This inhomogeneity gives poor physical properties to the final compound.

Other things being equal, the solvent softeners give soft, but nervy compounds. It is as though they form a soft, elastic gel which distorts easily without breakdown. They give the softest and snappiest vulcanizates. With less solubility the effect known as lubrication comes into play. This is noted when the solubility is good, but not too good and results in a flat, smooth running stock. As the solubility decreases, the lubricating action becomes more pronounced. Only small amounts of such softeners can be used, and their effect is to flatten the stock, increase the smoothness of tubing, prevent sticking to the rolls of mills and calenders, and lessen building tack. With such softeners care must be taken to prevent bleeding from the final article unless this is desired. In many cases solubilities are affected by temperature, and a softener may be soluble on a hot mill and yet bleed from the cold stock. Mutual solubility is also an important factor in relation to freezing. In this case the effect seems to be analogous to that of the melting point or freezing point of a mixture.

Physical Properties of the Softener

The physical properties of a material likewise have an important bearing on its use as a softener. A low boiling point or a high vapor pressure is obviously undesirable because of evaporation during processing, storage, and use. The melting point is related to the low temperature resistance of the compound although the mixed melting point effect must not be overlooked. The hardness, modulus, and snap are related to the viscosity of the softener as are the ease of incorporation and milling. In general, those softeners with the lowest viscosity give the softest stocks with the highest rebound and lowest hysteresis. Liquid and oily materials usually take longer to mix into the rubber and have more tendency to break the batch than do the tars ground in by the action of the mill. With factices and gelled oils the action is like that of blending two rubbers.

Stickiness can be imparted to a stock by the use of resins or tars which are themselves inherently sticky; rosin, for example. This stickiness, however, is quite different from the tack inherent in natural rubber. A sticky stock will adhere to many things including the fingers and the mill rolls, often more tenaciously than it will stick to itself. A really tacky stock, on the other hand, does not adhere especially to other materials, but coalesces quickly with itself. The softeners which come closest to making synthetic rubber tacky appear to be those which are fairly sticky, which themselves have fairly heavy body, and which form rather tough gels with the rubber. If the compound contains such a softener, the tack can be improved by the use of a volatile, mobile, and penetrating solvent which imparts a very soft, sticky surface for a short time and then by evaporation or by diffusion into the body of the stock allows the interface to stiffen and strengthen in a short time. Lubricating softeners decrease both tack and stickiness.

To be an effective dispersing aid a softener should have a functional group with high adhesive, or wetting characteristics, with respect to the pigment and another functional group or a hydrocarbon residue which is very soluble in the rubber. The classic example is stearic acid with its carboxyl group to be adsorbed on the channel black particle and its long hydrocarbon tail to be soluble in natural rubber.

Compounding Theory

The selection of the most effective method of studying softeners is a real problem. To get a positive answer on a single softener one should use several ratios of softener to rubber, several types of pigment, and several sulphur-accelerator ratios with each. This would mean the evaluation of 10 or 15 compounds for each softener. Since there are 500 to 1,000 materials to consider for each rubber, a complete study of each is hardly practical. Hence it seemed advisable to start with what we call a "survey study." For such a study a base compound is selected, and to it is added the same amount of a great variety of materials. The most important measurements are made on each compound, and the results analyzed for their significance. Obviously, the base compound cannot be the best for all softeners so that considerable interpretation of data is essential. Fortunately for such interpretations, we find that the variation in properties with changes in recipe or cure usually form smooth curves. For example, Figure 1 shows the variation in tensile and modulus for different loadings of cumar in a Hycar rubber. Figure 2 shows similar variations in hardness. These compounds were adjusted for sulphur

and accelerator to the amount of softener in the stock. It is observed that all of the points do not fall exactly on the curves, yet we find them to be sufficiently accurate for product compounding.

A survey study, properly interpreted, will indicate which softeners are worth further consideration and which can be dropped. Coupled with a knowledge of chemical composition and physical properties of a new material, it enables one to make a rather accurate prediction of the utility of that material. The next step is, of course, a more intensive study of those softeners which look most promising in the survey. Finally one should make a second comparison using the best compound obtained with each type of softener.

Preliminary Solvent Study

This survey study is devoted primarily to softeners which exert their effect on GR-S through physical changes alone. They do not react chemically with the GR-S itself, but instead behave as solvents, swelling agents, lubricants, extenders, and some as tackifiers. A smaller group also acts as an anti-softener or stiffener. Although a given softener under consideration might not soften GR-S through chemical action, the molecular configuration of the softener under consideration is of prime importance inasmuch as it determines to a large extent the solvent action of the softener on the GR-S. The degree of solvent action places the softener in one of several large groups.

Usually the most effective type of softener for making a compound more plastic, lowering the durometer hardness of the vulcanizate, and increasing its rebound is a softener which is also an excellent solvent for the rubber under investigation. The partial solvents usually behave as swelling agents, and the non-solvents frequently impart a lubricating action and can be used only in small amounts because of their incompatibility with the rubber. A third group modified the rubber by additive action, that is, by imparting its own physical characteristics to those of the GR-S. For example, a very sticky material, if used in large enough quantities, will impart tackiness to the GR-S, while a very stiff plastic-like material, such as shellac, will impart its stiffness to the GR-S. Obviously the effects obtained with combinations of softeners are practically endless.

At the start of any softener study it has been found most helpful to conduct a solvent study on the rubber under consideration. The solvents used (usually between 50 and 100 in number) are carefully selected to include most of the common functional groups and radicals and representative members of common chemical compounds. By observing the solvent action of the selected groups of materials on well-milled, unvulcanized GR-S it was possible to predict the softening action of most softeners and to divide them roughly into large groups. For example, it was observed that straight chain aliphatic hydrocarbons were effective solvents; while many branched chain aliphatics were not. Halogenated hydrocarbons and terpenes exert notable solvent action. The carbonyl group contributes to poor solubility particularly in low molecular weight aldehydes and ketones. The amino and hydroxyl groups hinder solubility to the greatest extent, as observed in the behavior of amines, phenols, and alcohols. Octyl alcohol was found to be a non-solvent in spite of its rather large hydrocarbon residue. Low molecular weight esters were poor solvents, but esters, as a class, are superior to the corresponding alcohols. Butyl acetate is a fair solvent in contrast with butyl alcohol, which is a non-solvent. In general hydrocarbon residues tend to promote solubility, but their efficiency in this regard is considerably retarded by the presence of a highly polar group.

Numerous other examples could be cited, but these are beyond the scope and purpose of this article. In general the solvent study can be narrowed down to the following classifications:

Solvents	Aromatic hydrocarbons
	Chlorinated hydrocarbons
	Aliphatic hydrocarbons
	Terpenes
Partial Solvents	Esters
	Ketones — high molecular weight
	Naphthalenes
Non-Solvents	Alcohols and phenols
	Ketones — low molecular weight
	Branched chain aliphatics
	Amines
	Ether-alcohols

Based on the above very brief classification, it appeared logical to predict that most hydrocarbons and chlorinated materials would function as effective softeners for GR-S. This should also be true for terpenes and related compounds such as gum turpentine and rosins. It was also predicted that high molecular weight alcohols (waxes) and amines would exert little softening action. Esters (including soaps), ketones, and naphthalenes in general would vary in their softening action, and their effectiveness would depend largely on their molecular weight, other functional groups, and general physical characteristics. While many exceptions to these predictions were encountered, it was found most helpful to use the solvent study as a guide in conducting a softener investigation involving such a large number of materials.

Compounding Procedure

The following recipe was selected as being most suitable for this study:

100.00	GR-S
45.00	MPC channel black
5.00	Zinc oxide
1.00	Age-Rite HP
1.75	**Sulphur**
1.50	Santocure
10.00	Softener
164.25	

The GR-S was a blend containing equal parts of this material from three sources. Since ten parts of softener are widely employed for many purposes, this amount was adopted for use in the above recipe. Many softeners tend to retard cure to varying degrees which made it desirable to adjust the sulphur-accelerator ratio so that the majority of all materials tested would cure satisfactorily between 30 and 75 minutes at 280° F.

A master-batch containing the above ingredients, with the exception of the accelerator and softener, was mixed in a No. 11 Banbury in two 500-pound batches. The softener and the accelerator were then added to the designated portion of the master-batch on a 12-inch laboratory mill. The size of the laboratory batch was five times the above recipe in grams. A definite mixing procedure was followed in every case.

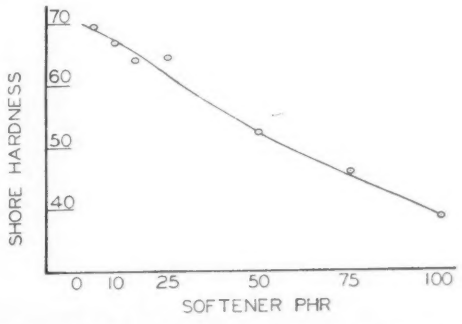

Fig. 2. Variation in Hardness for Different Loadings of Cumar in Hycar Rubber

A comprehensive series of physical tests was run to determine the effect produced by the various softeners.

1. *Tensile strength, elongation at break, and modulus at 300% elongation.* Values were determined for a series of five cures: namely, 15, 30, 45, 75, and 150 minutes at 280° F.

2. *Durometer hardness.* Determined with the Shore A durometer on stocks cured for 30 and 45 minutes at 280° F.

3. *Schopper rebound.* Determined on stocks cured for 30 and 45 minutes at 280° F.

4. *Plasticity.* Determined on the uncured batch stock with the Goodrich plastometer. Readings were taken at 35, 85, and 100° C., using a five-pound weight.

5. *Crescent tear.* Determined at room temperature and 212° F. on stocks cured for 30 and 45 minutes at 280° F. Results are expressed in pounds per $\frac{1}{10}$-inch thickness of the test piece.

6. *Hysteresis.* Determined on the Goodrich flexometer. Rapid cyclic compression, 17½% stroke, 55-pound weight. Run on two samples cured for 40 and 55 minutes at 280° F.

7. *Flex life.* Determined on a vertical DeMattia machine at 82° F. and 45% relative humidity. Machine was operated at a speed of 300 oscillations per minute with a one-inch stroke. Test pieces were one inch wide with a transverse pierced groove across the middle.

8. *Processing.* The time required to add each softener was noted. A portion of the batch stock was milled, and its behavior observed during this operation. Satisfactory milling was indicated by the presence of a rolling bank and a smooth band of stock which shows no tendency to split or adhere to the mill roll. All compounds were submitted to a laboratory tubing test which afforded a reliable indication of processing behavior.[2]

9. *Tack.* A portion of each batch was milled for five minutes and sheeted out. Tack determinations were made immediately after milling and at subsequent intervals of five minutes, one hour, and 24 hours. Small sections of the sheeted stock were pressed together; the degree of tack was observed as the pieces were slowly pulled apart. It is realized that this method is subject to personal error; however since no generally accepted method exists for accurate tack determination, it was considered satisfactory. To minimize variation all observations were made by the same operator.

The effect produced by the various softeners was determined by comparison with a reference standard. In order to establish an accurate standard, control batches in which the softener was omitted were run at frequent intervals. Average values for the various physical properties of this reference standard determined as described above are listed in the following table:

AVERAGE PHYSICAL PROPERTIES OF REFERENCE STANDARD

Cure at 280° F.	300%	Tensile	Elongation
Min.			
15	Break	Only	675
30	1150	2500	450
45	1350	2300	400
75	1500	2200	360
150	1650	2100	310
	30′ Cure		45′ Cure
Hardness	63		65
Rebound	41		42
Tear at R. T.	27		26
Tear at 212° F.	18		16
	ΔT		% P. S.
Hysteresis (40′)	43		12
Hysteresis (55′)	42		10
Plasticity 35° C.	3.8		
Plasticity 85° C.	24.0		
Flex Life	50,000		
Tack	Poor		

Classification of the Softeners

The materials selected for this study embraced a wide variety of pure chemicals, vegetable and mineral oils, waxes, tars, pitches, and resins. In addition to most of the recently developed commercial plasticizers, a majority of the softeners in general use by the rubber compounder was included. The great number of materials examined made it highly desirable to formulate a systematic classification of the softeners which would summarize the outstanding properties of these materials in a concise and readily available form. The test data were reviewed for the recurrence of characteristic trends which might assist in a systematic classification of this nature. Chemical composition appeared to be the most logical basis, and with the exception of a group of commercial plasticizers and miscellaneous materials of unknown composition, the softeners could readily be adapted to such an arrangement. A separation into 16 groups was made on this basis.

It was possible to arrive at pertinent generalizations which, although they do not hold invariably for all members of a group, present a sufficiently accurate picture of physical properties and behavior considered typical for that group. Variation within the individual group may be assigned to a variety of causes. Prominent among them might be mentioned the effect of large hydrocarbon residues which outweigh the typical reactions of the functional groups upon which many of the classes are based. For example, the true effect of the carbonyl group as observed most readily with acetone is masked almost entirely when high molecular weight ketones are employed. The wide variation between acetic and stearic acids would likewise serve as an example. Representative properties for 16 groups of softeners are presented in the discussion which follows. A few examples of typical members from each classification are cited.

Class 1 — Esters

Examples: Dibutyl Phthalate, Tributoxy Ethyl Phosphate, Ethyl Ricinoleate, Chlor Dibutyl Carbonate

Many esters exert a definite solvent action upon GR-S and hence act as efficient plasticizers. They lower tensile and modulus and produce a remarkably uniform increase in elongation. Durometer hardness of the cured stock is lowered from five to ten points in most cases. Rebound is maintained well at all times and is increased appreciably in several instances. A general tendency toward increased plasticity was observed; the phthalates were most effective in this regard. Tear resistance is lowered moderately. Hysteresis is lowered in most cases. Flex life is shortened as a general rule. Only a very few cases of increased flex life were observed; chlor dibutyl carbonate was the only material to produce a significant improvement without an increase in hysteresis. Esters offer some assistance in milling, and a few aid in tubing. Uniformly poor tack is observed except with esters of the higher fatty acids where some improvement is apparent. There is no effect on cure in the majority of cases. Most esters blend readily with GR-S during the milling operation.

Dibutyl phthalate and other esters are employed successfully to improve low temperature flexibility. Bodied soya bean polyester is outstanding in its ability to prolong flex life with little increase in hysteresis. Acetoacetic ester is a powerful retarder. Tetrahydro furfuryl diacetate and chlor dibutyl carbonate yield a valuable increase in flex life. Methyl ricinoleate improves tack.

Class 2 — Aromatic Hydrocarbons

Examples: Xylol, Decalin, Diphenyl

The materials in this category plasticize chiefly through the action which they exert as solvents or swelling agents. They decrease tensile strength and modulus to a small extent and produce a minor increase in elongation. Durometer hardness is lowered slightly. Rebound is unchanged

[2] A full description of this test appears in *Ind. Eng. Chem.*, 34, 1311 (1942).

or slightly increased in a few instances. Increase in plasticity resulting from solvent action lends some assistance in processing and is the most outstanding feature of this group of materials. They show little effect on tear resistance. Although decalin gives somewhat better flex life, there is no significant increase as a general rule. No increase occurs in hysteresis, and no improvement in tack. No effect on cure is noted.

Class 3 — Chlorinated Hydrocarbons

Examples: Dichlor Benzene, Aroclors

Most of the materials in this group may also be classified as solvent-type plasticizers. Their effect on the physical properties of GR-S is almost identical with that of the aromatic hydrocarbons of Class 2. Chlorination of an aromatic hydrocarbon appears to exert only minor variations as far as the plasticizing action on GR-S is concerned. A small increase in plasticity in a few instances was the only observed difference. Rebound is maintained well. The Aroclors, which serve as efficient plasticizers for other purposes, were of little value in GR-S.

Class 4 — Ethers

Examples: Hexyl Ether, Diphenyl Ether

Most of the ethers examined were of higher molecular weight and fair solvents for GR-S, in contrast with the lower molecular weight ethers which are poor solvents. The effect they exert as plasticizers is probably due chiefly to solvent or swelling action. Like other solvent materials, they do not alter the physical properties of GR-S to any appreciable extent. Increase in plasticity is small, with little advantage secured in the way of improved processing. There is no improvement in flex life or tack. Average rebound is good, with diphenyl ether showing an appreciable increase. Dibenzyl ether is the most effective softener of this group.

Class 5 — Ketones

Examples: Acetonyl Acetone, Phorone

Acetone and similar lower molecular weight ketones are very poor solvents for GR-S. Solubility increases markedly with increasing molecular weight or a higher degree of unsaturation. For example, acetone is a non-solvent; while phorone (sym. di-isopropylidene acetone) is a reasonably good solvent. Most of the ketones examined were of higher molecular weight so that the increase in plasticity which they imparted was due principally to solvent action. As a class, they give somewhat lower tensile strength and modulus with a small increase in elongation. Durometer hardness of the cured stock averages about three points lower than the control. Rebound is maintained well in most cases. Plasticity is increased. There is little change in tear resistance and small increase in hysteresis. Some improvement in flex life is observed. Ketones are poor tack producers. They show some tendency to smooth out the stock and give better tubing.

Class 6 — Alcohols

Examples: Octyl Alcohol, Benzyl Alcohol

Alcohols, particularly those of lower molecular weight, are extremely poor solvents for GR-S. They are taken up with reasonable ease; however the minor increase in plasticity shown in most cases is probably due to a lubricant action rather than to any small degree of solvency which they might exhibit. Some tendency to accelerate cure is observed. Alcohols do not enhance the physical properties of GR-S to any appreciable extent and are considered of little importance as softeners for this type of rubber.

Class 7 — Phenols

Examples: Diamyl Phenol, Wood Phenols

Phenols resemble alcohols in their behavior toward GR-S. Like alcohols, they are very poor solvents for this type of rubber. They exhibit no tendency to improve any of the physical properties of GR-S and are considered to have comparatively little value as plasticizers. Tertiary butyl catechol is employed as a shortstop during the polymerization process, but has an adverse effect when ten parts are added as a softener. It is an effective tackifying softener in the acrylonitrile copolymers.

Class 8 — Amines

Examples: Triethanolamine, Dicyclohexylamine

These materials are not regarded as softeners or plasticizers in the ordinary sense of the word; however they exhibit several features of considerable interest. Amine salts of the fatty acids present in the rubber are formed which act as wetting agents and assist in pigment dispersion. Tack is somewhat improved after neutralization of the excess fatty acid. Amines accelerate cure, in fact excessively so at the ten-part addition. It is neither necessary nor desirable to add this amount since a one-half to two-part addition of triethanolamine is sufficient to obtain the beneficial effects produced by this material. Considerable time is required to incorporate ten parts of trithanolamine, but addition of two parts can be regulated so that no additional processing time will be required, especially if the amine is added with the black. Stocks containing amines show little change in tensile strength, but usually have lower modulus and increased elongation. Increase in plasticity is not great. Some improvement in flex life is observed. It has also been observed that amines tend to show reversion of cure, which fact may be of assistance in improving the aging of GR-S stocks.

Class 9 — Vegetable Oils

Examples: Various Types of Raw and Processed Linseed, Castor, Soybean, and Other Vegetable Oils

The unpolymerized or raw vegetable oils of low viscosity, such as raw linseed oil, cottonseed oil, and palm oil, constitute a definite group insofar as their behavior as softeners is concerned. They lower tensile strength and modulus and increase elongation. They yield softer cured stocks with no decrease in rebound. Plasticity is definitely increased, and tear resistance is lowered. Flex life is slightly improved with no appreciable change in hysteresis. These oils are taken up rather slowly by the rubber and yield no improvement in tack. They have little effect on cure. Some improvement in tubing, however, is observed. Low viscosity oils plasticize chiefly through lubricant action. No marked difference is apparent between drying and non-drying oils when they are employed as softeners. These oils find considerable use in hard rubber compounds.

Polymerized oils such as 4212 solid soya, 4125 solid linseed, and Plastogel constitute a second distinct group. They are essentially highly polymerized oils and should not be confused with the factices or vulcanized oils which have less value as plasticizers. The general trend observed with these materials is a decrease in tensile and modulus with a marked increase in elongation. Little change takes place in cured hardness, and rebound is lowered. The majority tend to decrease plasticity. Tear resistance is improved. Flex life is lengthened, but hysteresis is usually increased. A few of these oils yield a small degree of tack. They smooth out the stock during extrusion with resultant improvement in tubing operations. A tendency to retard cure is noted. These oils are regarded as extender-type softeners with more apparent value when they are used in larger proportions as extenders, both in a normal recipe and

in a high softener—high black combination. They are taken up readily during milling.

Refined Bogol, tall oil, and Liqro, all of which are tall oil derivatives, met most of the requirements of a good softener and in addition were outstanding in their ability to yield increased flex life. Ordinary castor oil will bleed from a cured stock and is of minor value as a softener; nevertheless some of the processed castor oils gave fair results. The Cardolites, although not outstanding, are considered reasonably effective softeners for GR-S.

Class 10 — Fatty Acids

Examples: Oleic Acid, Lauric Acid

Only the higher fatty acids were examined. They function chiefly as lubricants and are similar in behavior to the unpolymerized vegetable oils. They have little effect upon tensile strength, giving lower modulus and increased elongation. Only a small increase in plasticity is produced; yet processing is improved considerably. Three cases of improved flex life were noted, but the accompanying heat rise was rather high. Most of these materials have little effect on cure; while a few tend to retard. The principal value of fatty acids lies in their ability to smooth out the stock, which action offers considerable assistance during tubing and calendering operations.

Class 11 — Petroleum Products

Group A — Solvents

These materials will dissolve GR-S and hence plasticize chiefly through solvent action. They increase plasticity to a small extent, but are of minor importance as softeners. No appreciable increase in either tack or flex life is produced.

Group B — Mineral Oils

Examples: Paraffin Base Oil, Circo Light Oil

While they undoubtedly exert some solvent or swelling action, these oils are effective chiefly through their behavior as lubricants. Tensile strength and modulus are lowered with some increase in elongation. Cured stock is appreciably softer. Some increase in plasticity results from addition of these materials. Rebound is generally unchanged and is higher in several instances. Tear resistance is poorer. Hysteresis remains unchanged, and no lengthening of flex life is apparent. The oils are taken up readily and have little effect on cure. They tend to decrease tack except when used in combination with a tackifying resinous softener.

Group C — Asphalts and Related Materials

Examples: Paraflux, Asphalt No. 6

These materials maintain good tensile strength with decreased modulus and increased elongation. Durometer hardness of the cured stock is lowered to the extent of five points or more. Rebound undergoes little variation. In most cases there is not much change in tear resistance. Some improvement in flex life is observed, with no increase in hysteresis. Tack is imparted to a small degree. Asphalts blend readily with the rubber and have little effect on cure. Plasticity is considerably increased by most materials of this nature. Pigment dispersion is facilitated with corresponding improvement in general processing behavior. The members of this group aid in tubing and calendering, particularly in high softener-high pigment combinations. They are widely used for softening purposes.

Group D — Unsaturated Petroleum Derivatives

Examples: Naftolen, Oroplast

These materials enjoy wide use both as softeners and extenders. They blend readily with GR-S and can be employed to advantage in considerable percentages. They impart high plasticity and are of definite assistance in processing and molding operations. They are employed with uniform success in high softener-high pigment combinations for a variety of uses. Tubing is improved. Cure is retarded unless additional sulphur is used. Elongation is increased, and softer stocks are produced. Some increase in flex life is observed, with a tendency toward higher hysteresis. These materials lend a very useful degree of tack.

Class 12 — Pine Products

Group A — Terpenes

Examples: Dipentene, Pine Oil, Terposol 3

These materials are excellent solvents for GR-S and disperse quite readily during milling. They lower tensile strength and modulus, with considerable increase in elongation. Cured stocks are effectively softened. Rebound undergoes only slight changes. Little variation occurs in tear resistance. The improvement in flex life is obtained with a small, but uniform increase in hysteresis. This rise in hysteresis with parallel lengthening of flex life appears characteristic of terpenes as distinguished from other solvent-type materials such as the aromatic hydrocarbons of Class 2. A few terpenes, such as Terposol 8, impart a fair degree of tack. Most of these materials yield high plasticity and make effective softeners.

Group B — Gum Turpentine

Examples: Crude Gum Turpentine

These materials are the crude gummy exudate which results from tapping the pine tree. They consist of complex mixtures of rosin and terpenes which blend quite readily with GR-S and are regarded as solvent-type plasticizers. They constitute a particularly useful type of plasticizer for many purposes. Tensile strength is increased; modulus is quite low; while elongation is much higher than that obtained from the control stock. The cured stock is softened somewhat, but rebound is lowered. Tear resistance is rather poor. Flex life is lengthened appreciably, but hysteresis is quite high. There is some tendency to retard cure. An outstanding feature of these materials is their ability to impart a definitely useful degree of tack to GR-S. They increase plasticity to a moderate extent and aid pigment dispersion through strong wetting action.

Group C — Rosins

Examples: Rosin Oil, Ester Gum, and Most Commercially Available Grades of Rosin and Rosin Derivatives

Original tests on these materials were made at the same sulphur-accelerator ratio employed in the standard softener recipe. Owing to the pronounced retarding action of rosin, the stocks were undercured, with resultant low tensile, high elongation, increased flex life, and abnormally high hysteresis. The tests were repeated with 0.75 PHR additional sulphur to obtain normal cures, and the properties presented herewith are based on data for those cures.

Tensile strength is lowered; modulus is high, and elongation is considerably increased. Durometer hardness is increased by three to seven points. Rebound is definitely lowered. Tear resistance is rather poor. There is little change in plasticity. Nor is tubing improved. All of these materials impart a considerable degree of tack to GR-S. Rosin oil is widely used as a tackifier both singly and in combination with other plasticizers. H.D.H. rosin, Benny resin, and ester gum produce somewhat better tack than other types of rosin. Flex life is appreciably increased at optimum cure, but hysteresis is still somewhat high despite the increased sulphur content. Benny resin

appeared most interesting as an aid in prolonging flex life and retarding crack growth. The individual components of Benny resin: namely, Bexin and Purby resin, were examined, but gave less satisfactory results than the composite resin itself. Belro resin is quite similar in composition and behavior to Benny resin.

Most rosins blend quite readily with GR-S at normal milling temperatures. They are soluble in the rubber, and it is not necessary to process at temperatures above their melting point to effect complete dispersion. Limed rosins, such as Maroc 6 and Helix, and zinc resinate, such as Zirex, have considerably higher melting points and require a minimum processing temperature of 250° F. for thorough dispersion. Galex W-100 and Staybelite, the non-oxidizing grades of rosin, gave no better results than ordinary FF wood rosin. The non-acid portion of gum rosin produced less tack than the acid component. Physical properties of the stock were also inferior. The behavior of any one rosin might be regarded as typical for the entire group. Individual members exhibit only minor variation from the set of properties established above.

Group D — Pine Tars

Examples: Thin, Medium, Etc., Pine Tar, Retort Pine Tar

Pine tar has been employed with uniform success as a softener both in natural rubber and GR-S. It gives improved tensile strength, lower modulus, and increased elongation. Cured stock is definitely softer with lower rebound. Little change occurs in tear resistance. Flex life is lengthened appreciably, but hysteresis is likewise increased. Pine tars impart a fair degree of tack, are taken up readily, and assist in pigment dispersion. The large increase in plasticity is evidence of effective softening action. Some aid in tubing is secured. Pine tars also are acidic in nature and tend to retard cure. They supplement the action of stearic acid, especially with accelerators that require acid activation. Acidic-type softeners, of which the pine products are fairly representative, tend to increase flex cracking resistance. This remark does not apply to fatty acids.

Class 13 — Resins Other Than Rosin

Examples: Bakelite 4036, Rezyl No. 40, Shellac

Certain properties can be established as characteristic of the entire group of resinous materials while outstanding individual features are observed in a few cases. General trends indicate definitely higher tensile strength, low modulus, and increased elongation. Durometer hardness of the cured stock is higher. Rebound is uniformly lower. Resistance to tear is maintained well and is improved in several cases. Resins yield a small increase in flex life with a moderate rise in hysteresis. They impart a fair degree of tack. Stocks are usually quite sticky at higher temperatures and sometimes cause trouble during milling. They blend quite readily with the rubber at normal processing temperatures, and it is usually not necessary to exceed the melting point of the resin to effect complete dispersion. There is usually no effect on cure. Their addition, up to ten parts on 100 of GR-S, gives no improvement in tubing.

Bakelite 4036 is one of the best tackifiers of the entire study. It imparts a very useful degree of tack which persists for a considerable period of time. Stocks containing this resin respond well when freshened with solvents. Other properties of this resin are of more than average interest.

Petrex is a powerful retarder, probably owing to its unsaturated nature.

Alkyd resins are readily compatible with GR-S, but apparently offer no outstanding features as plasticizers. Their presence detracts little from physical properties of the cured stock; hence alkyds have more practical value as extenders.

Guayule resin was found to have little value as a tackifier.

Shellac produces rather stiff stocks at room temperature which are readily thermoplastic, as is the case with most resins. Shellac acts as an effective softener and tackifier and aids processing at higher temperatures. It improves molding characteristics of GR-S and also helps to smooth out the stock. It will increase tack at room temperature when used in conjunction with a liquid softener.

Para Resin produced highest tensile strength with good elongation.

Age-Rite Resin functions well as a plasticizer. Stress-strain properties are excellent; plasticity is high, and tear resistance is improved. It retains elongation well on aging and is more effective than Age-Rite Resin D.

Class 14 — Coal Tar Products

Group A — Tars

Examples: Soft Coal Tar, Bardol

The lighter coal tar fractions exhibit rather poor tensile strength; while the heavier fractions have fair tensile strength, lowered modulus, and increased elongation in GR-S. Durometer hardness of the cured stock averages five points lower than the control. Rebound is maintained well and is increased in a few instances. Tear resistance is generally lower. There is no appreciable change in either flex life or hysteresis. Effect on tack is small. This group of materials is widely used because of their ability to produce a marked increase in plasticity which facilitates general processing behavior during milling and subsequent tubing operations. Many have no effect on cure, but a few, like Bardol, act to accelerate cure. The mechanism of their action as plasticizers is most likely due to a combination of solvent and swelling behavior plus the fact that they also serve as lubricants.

Group B — Coumarone-Indene Resins and Oils

Examples: Coumarone-Indene Derivatives from Dipolymer Oil to Hard Coumarone-Indene Resins

As a group, these materials detract little from the tensile strength of the original stock, and in a few instances a useful increase is produced. Modulus is generally lower, and elongation at optimum cure is increased. Cumar resins and oils are taken up readily during milling and offer considerable assistance during many processing operations.

The lighter fractions, as for example dipolymer oil, exert a pronounced solvent action which increases plasticity and also lowers the durometer hardness of the cured stock by as much as ten points. These fractions affect rebound only slightly, but detract somewhat from tear resistance. Hysteresis remains unchanged, and there is no improvement in flex life. A small increase in tack is observed.

The resinous members of this group, such as cumar resin, also produce a marked increase in plasticity, particularly at higher temperatures. Durometer hardness of the cured stock averages a little lower than the control. Rebound is generally lower. Tear resistance at room temperature is improved, with little change at 212° F. A moderate rise in hysteresis is accompanied by a small improvement in flex life. Tack is somewhat improved.

Group C — Special Oils

Example: PHO Plasticizing Oil

Although the members of this group are not closely related chemically, their location at this point is based both upon source and the similarity of their action as plasticizers. They function efficiently as softeners, PHO Plas-

ticizing Oil being the outstanding member of the group. They increase tensile strength, lower modulus and give higher elongation. A small increase in flex life is observed with little change in hysteresis. PHO Oil imparts slightly better tack. Plasticity is considerably increased through solvent action, resulting in improved milling and easier dispersion of compounding ingredients.

Class 15 — Waxes

Examples: Paraffin, Syncera, Ceresin

These materials disperse quite readily in the rubber, particularly so on a warm mill. At ordinary temperatures they are really not compatible with the rubber, and most of them will bleed to the surface. Waxes function somewhat as lubricants, and the general trend is toward increased plasticity. Tensile and modulus are lowered with little change in elongation. There is little variation in hardness, rebound, or tear resistance. Hysteresis is usually lowered, and flex life is shortened. Waxes are frequently employed to retard sun checking or cracking. They function by blooming to the surface where they form a flexible protective film. Tack is completely destroyed in most cases. Ten parts per 100 of GR-S were employed in these tests, which is considerably more than the amount ordinarily used. Even a very small percentage will bleed to the surface. There is little apparent effect on cure. Carnauba wax has a higher melting point and does not bleed. Waxes must be avoided where adhesions are involved.

Class 16 — Miscellaneous Materials

It was necessary to assemble a rather large group of materials in this category primarily because they were identified by number only with no reference by the supplier as to their actual composition. Their effect on GR-S varied widely, making it impossible to establish a set of properties descriptive of the entire group. It is thus necessary to call attention to the outstanding properties of a few individual materials which proved effective as softeners.

The XP series of Sharples plasticizers are sulphur-containing organic compounds. Plasticizers XP-35 and XP-144 accelerate cure; while XP-149 is a retarder. XP-35 is a good tackifier. In general, these materials increase tensile and decrease elongation. Increase in plasticity is small. Durometer hardness is raised.

Piccocizer 30 blends quite readily with GR-S and produces a valuable increase in plasticity. Stress-strain properties show little variation from the control. Modulus is lower, and vulcanizates are softer. Flex life is prolonged with minor rise in hysteresis. This material is regarded as an effective softener and processing aid.

Reogen produces a soft cured stock with low modulus and good tensile strength. It is of definite assistance in processing as evidenced by the large increase in plasticity. Bondogen is similar in composition and properties to Reogen. Both retard cure.

Plastone proved to be an interesting material which gave stocks with high elongation, improved tensile strength, and low modulus. It increases plasticity and also imparts a fair degree of tack. Tear resistance remains unchanged. Flex life is lengthened, with a negligible rise in hysteresis. Plastone was one of the few members of this group to yield improved tubing.

Pentacizer 180 and Pentacizer 188 are resinous materials which gave a fair degree of tack.

Softener No. 20 increases plasticity and improves processing. It also gives a small improvement in flex life.

Cottonseed pitch increases plasticity, improves tear resistance, and yields better tubing. Rebound is lowered.

Mineral rubber and Gilsonite, while they are not effective as plasticizers, find considerable application as extenders.

Wool grease and a few similar materials are sometimes employed as processing aids during calendering and extruding operations. They tend to destroy tack. Cured stocks are softer, but other physical properties undergo little change.

Cardanol 1062 is considered an effective softener. It lowers modulus and increases elongation. The cured stock is softer with good rebound. It incorporates readily, increases plasticity, and lengthens flex life with a minimum rise in hysteresis.

Goldenrod rubber is an effective softener. It provides some features ordinarily associated with natural rubber.

Glue increases modulus and gives a stiff cured stock with high durometer hardness.

Amalgamator Z-4 incorporates readily and imparts a number of useful features. Tensile strength is maintained well, with lower modulus and increased elongation. Some increase in flex life is observed. This material shows some tendency to smooth out the stock and give better tubing.

Addaplast 16 and 20 produce a small increase in flex life with no appreciable rise in hysteresis.

Plastoflex 10 and 20 give increased rebound and high plasticity.

Plasticizers NTD-181.5-C and DN-2-182-C produce unusually high plasticity and resultant soft cured stocks.

Plasticizer SC (an ester) yields high plasticity and good low-temperature properties.

Plasticizer OR-10 gives excellent plasticity, but is not above the average in other respects.

Tetrahydroxy dioxan gave excellent flex life with remarkably low hysteresis. A recheck at slightly increased sulphur content did not substantiate the original results although a useful improvement was observed.

Benzoic acid produces a stock with high durometer hardness. It also gives improved tear resistance both at room temperature and at 212° F.

Synprowax is a resinous material which retards cure, lowers tensile strength and modulus, and increases elongation. It is readily compatible with GR-S and increases plasticity. Tear resistance is poor. The material also imparts a useful degree of tack. Hysteresis is high. Flex life is lengthened, and resistance to crack growth is considerably improved.

Several products designed chiefly as tackifiers were examined. A subsequent discussion of their efficiency for the purpose intended is included with this report.

(*To be continued*)

Liquid Silicones

Liquid silicones, available in past months for restricted war uses, are now available for adaptation to any war use because of expanded production capacity. Known as Dow Corning fluids, these organo-silicon products are water white and reported to have an extremely low rate of viscosity change with temperature, compared to petroleum oils of equivalent viscosity. They also are said to have higher flash and fire points and a complete freedom from solvent or swelling effect on synthetic or natural rubber and on many plastics. Because of resistance to oxidizing solutions, mineral acids, salts, and alkalies, they have been used as an impregnant for asbestos packing and gaskets in chemical pumps. Made by Dow Corning Corp., two series of these fluids are available, depending on the temperature and viscosity range to be covered: Type 200 Fluids are useful down to — 40° C., or up to 200° C.; Type 500 Fluids at temperatures of — 70° C. and below.

Compression-Tear Test for Susceptibility to Road Cracking of Synthetics

S. G. Trepp,[1] A. L. Ward[1] and N. K. Chaney[1]

ONE of the outstanding weaknesses of GR-S rubber in tire tread formulations is a pronounced tendency to crack on road service. In general the cracks originate at the bottom of cuts, or of molded grooves in the tread, but spontaneous cracking may originate from local weak spots in the interior of the tread. Properly formulated natural rubber stocks are not susceptible to this type of failure, and usual laboratory and plant criteria and test methods developed by long experience for natural rubber formulations have been proved inadequate and misleading in respect to the evaluation of the susceptibility of GR-S rubber to this type of failure.

These considerations have led to the development of the compression tear test for susceptibility to cut growth which is the subject of this paper. The underlying principle of this test is to develop, under static, easily controlled, laboratory conditions the type of strain which is the normal resultant of impact shocks of indeterminate severity under road service conditions. When pressure is applied at the surface of a cut or groove in a tire tread, the usual result is to pinch the walls of the cut together at the surface and to force them apart midway of the cut, thus producing a shearing force on the rubber under compression at the bottom of the cut. The U. G. I. compression-tear test is designed to set up a shearing force under conditions of high compression at elevated temperatures, at the bottom of a standardized cut, and to measure the rate of cut growth with time.

It was suggested that this type of test be applied to a graded series of typical tire formulations. We have been advised that the compression-tear data have been successful in rating these formulations in the order of crack resistance indicated by their road history. Complete physical measurements on these same formulations show that this is not true of any other of the standard laboratory tests. It may be noted as further confirmation that a natural rubber tread composition gave zero cut growth on compression-tear test; also that a synthetic formulation in which 35% of the GR-S rubber is replaced by natural rubber gives compression-tear results most closely approaching 100% natural rubber. These findings are in complete agreement with all road test experience.

In general when any related series of synthetic rubber formulations are arranged in the sequence of their compression-tear resistance, such increase is accompanied by unrelated changes in other desirable properties as tensile strength, elongation, and hysteresis. Hence the optimum balance for various softeners remains to be worked out by further road tests on properly selected experimental formulations. It is of particular interest that the Winkelmann tear values do not show the same order as the compression-tears in the case of the 100% synthetics, although this test does serve to distinguish broadly between the natural rubbers on the one hand and synthetics on the other.

The fact that maximum compression-tear resistance involves compromises with respect to other desirable physical properties of synthetic rubbers such as tensile, elongation, and hysteresis shows the importance of a reliable laboratory technique for determining the relative susceptibility of experimental formulations to road cracking. Verification of these observations on a larger scale should greatly accelerate the improvement of GR-S tire tread formulations.

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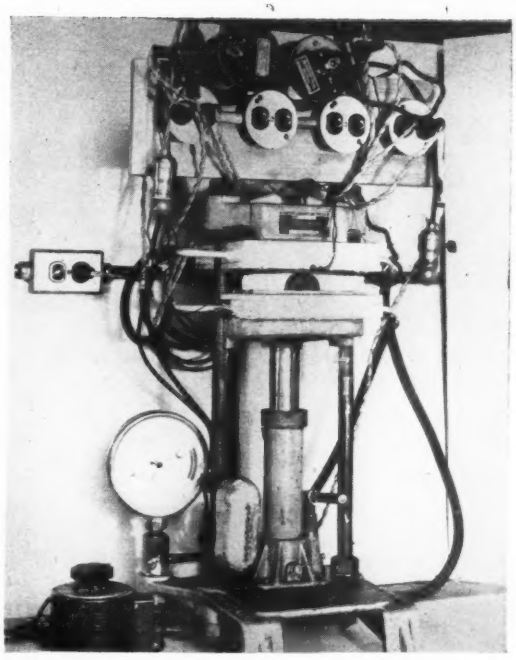

Fig. 1. Carver Laboratory Press and Equipment for Compression-Tear Test

Description of Compression-Tear Test Method

A press is required which is capable of maintaining a 2,000 p.s.i. load on the sample and whose plates are thermostatically regulated to 135° ± 5° C. At the U. G. I. Laboratory a Carver Laboratory hydraulic press is used (see Figure 1) having four heating units placed in each platen. The two outer units in each platen are heated continuously from a 50-volt circuit controlled by a Variac. The two inner heaters in each platen are controlled individually through a relay operated by a thermostat in the platen. The pressure is set by the gage.

Preparation of Test Samples

Test samples must be specially prepared. The unvulcanized stock to be tested is "refined" on a laboratory mill in the customary manner and is then sheeted out in a layer ¼-inch thick. Disks of approximately two inches in diameter are cut out of the ¼-inch sheet and piled on top of one another to the height of the mold (about one inch), and the pile of disks is then cut in half, ready for filling

the molds. Between 65 and 70 grams of material are required for each pair of half cylinders which must be enough to insure firm bonding of the individual disks without visible lamination after vulcanization. Should lamination cracks appear at the circumference of the test piece, indicating poor bonding in vulcanization, it should be discarded without testing. If an extrusion machine of proper orifice is available, this difficulty in preparation of samples is avoided.

The mold provides a number of semi-cylindrical cavities two inches in diameter and one inch thick. It was made by drilling two-inch holes in a steel plate one inch in thickness. These holes are then bisected by steel plates to form semi-cylindrical cavities.

Three cures are made at 115, 143 and 215 minutes, respectively, at 280° C., or the equivalent cures made for each stock tested. After vulcanization the semi-cylinders of rubber are removed from the mold and placed in a mitre box to make the test cut. This is between eight and nine millimeters deep. One view of the vertical cut is seen at the upper part of the test piece in Figure 2. The following precautions must be taken in making the cuts: (a) care must be taken that the cut is straight and at right angles to the surface, and to the edge of the cylinder; (b) care must also be taken that the depth of the cut is within the prescribed limits. Too deep a cut tends to grow more rapidly under pressure and gives poor checks. Too shallow a cut may not open properly in the center (see Figure 3) when the pressure is applied. Cuts that do not open will not grow at the normal rates and therefore will not give comparable results.

Testing Procedure

The test piece is placed in the press between the heated platens, as shown in Figure 1, and allowed to stand one minute at zero gage pressure to get up to temperature. A gage pressure of 2,000 p.s.i. is then applied for 10 minutes. After compression the face of the test piece should be observed by the operator to make certain the cut has opened properly. The pressure is then released; the test piece is removed, and the length of the cracks, or cut growth, on each side of the test piece is measured in millimeters. The compression-tear value is the sum of the cracks, including any branches, divided by two, i.e., the average cut growth per side.

The "spontaneous cracks," that is, those cracks, if any, not originating from the original cut are also measured and recorded separately. Such cracking is of relatively irregular incidence, but is not without significance, if a sufficient number of test observations are averaged.

The above procedures are repeated twice more, giving a total of 30 minutes' compression unless the growth in the first or second period reaches the limiting boundaries of the test piece. No test is continued if the average growth exceeds 10 millimeters per side in the first or second 10-minute intervals, since road tests indicate that such stocks are too poor to be of further interest. The final measurements after the third 10-minute period give the accepted compression-tear value for a given test piece unless the test is terminated earlier as noted above. Duplicate determinations (two half-cylinder test pieces) are made on each of three cures. Therefore the final compression-tear value represents an average of six individual test pieces.

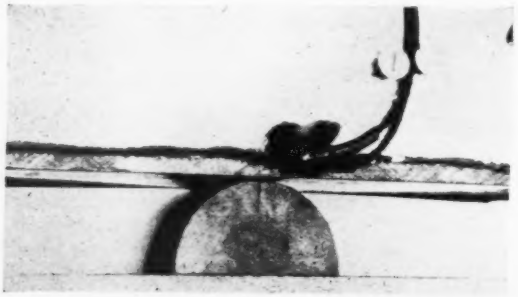

Fig. 2. Uncompressed Test Piece Showing Vertical Cut

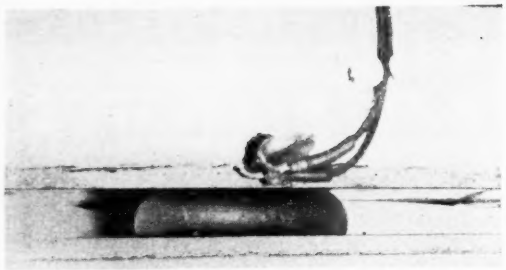

Fig. 3. Test Piece Compressed Showing Proper Opening of Cut

Development of the New Method

As stated above, the factors in the test appartus which directly affect the extent of cracking or "cut growth" are, respectively, pressure, temperature, and time. In order to make the tests in the shortest possible time the highest practicable pressure and temperature have been selected. The limits are set by the necessity of avoiding excessive permanent deformation in the test pieces. For the usual range of hardness a gage pressure of 2,000 p.s.i. will compress the height of the test piece between apex and base by about 60%. (See Figures 2 and 3.) If the compression is too great, it not only causes excessive permanent deformation, but alters the character of the resultant strains set up at the bottom of the cut. On the other hand, lower compressions unduly extend the time required to develop measurable cut growth.

A temperature of 135° C. was adopted for two reasons: first, because this is not far from the temperatures which may be actually reached under heavy service conditions; and second, because higher temperatures are also found to result in excessive permanent distortion of the test piece, and less reproducible cut growth.

With the temperature and pressure constants of the test established by the considerations above, the time or duration of pressure becomes the control variable for adjusting the severity of the test to the resistance of the test piece. In weak specimens the cracks may approach the boundaries of the test piece in a time of 10 minutes. On the other hand the more resistant specimens require 30 minutes to develop any measurable cracking. The intermittent application of pressure for very short time intervals was found to give results not measurably different from a continuous pressure for the same total length of time. Hence the routine finally adopted is to use consecutive pressure periods of 10 minutes each and measure the cut growth after each such period. If much more resistant formulations are developed, it may become necessary to extend the test period to 60 minutes to obtain satisfactory differences.

Effect of Curing Time on Compression-Tear

The effect of overcure varies widely with different formulations. Our experience to date may be summed up by saying that the compression-tear resistance of the poorer stocks appears to be extremely sensitive to extent of cure:

(*Continued on page 112*)

Polyethylene

Howard H. Irvin[1]

POLYETHYLENE is one of the most outstanding plastic materials that have been developed during the past decade. Its many desirable properties open a large field of potential uses, once it can be released for the civilian market. The simple and uniform structure of polyethylene should also prove helpful to the research chemist in his efforts to gain a better understanding of high polymeric substances.

Review of Past Developments

For a great many years it had been known that a polymer composed of a chain of methylene links of the general formula

$$\left[\begin{array}{c} H\,H\,H\,H\,H\,H\,H\,H \\ -C-C-C-C-C-C-C-C- \\ H\,H\,H\,H\,H\,H\,H\,H \end{array}\right]_n$$

can be formed. Bamberger and Tschirner (2)[2] in 1900 reported the formation of a polymethylene by decomposition of diazo methane:

$$n\ CH_2N_2 \longrightarrow (CH_2)_n + n\ N_2$$

This product had a melting point of 128° C., from which these investigators computed a chain length of 170 carbon atoms. Staudinger (15) reported similar polymers in 1930, which he obtained by the reduction of polyvinyl bromide with hydriodic acid.

The petroleum industry has experimented extensively with the polymerization of ethylene over a long period of years (10). These experiments were concerned mainly with the formation of higher olefins and paraffins for use as gasoline and greases. This work was carried out at temperatures up to 500° C. and pressures up to 70 atmospheres and did not lead to a true chain polymerization. However indications of high polymers were obtained in some of these reactions. Fischer and Tropsch (9) reported in 1927 the formation of solid paraffins in the catalytic synthesis of gasoline from water gas. At a temperature of 280° C. and pressures ranging from 10 to 15 atmospheres, they passed sulphur-free water gas over a catalyst consisting of an iron-copper complex, impregnated with potassium carbonate, and they obtained solid products having a molecular weight of about 1,000 and a melting point of 104-117° C. Pichler (13), in 1938, reported the use of ruthenium as a catalyst in the Fischer-Tropsch synthesis, and the formation of solid paraffins of molecular weight 800. Gaseous, liquid, and solid products were obtained. The snow-white solid polymer melted at 118-119° C. By being treated with solvents, it was separated into higher and lower molecular weight hydrocarbons. An appreciable portion consisted of a polymer melting between 120 and 130° C.

The great step forward, however, was taken when ethylene itself was polymerized, with the formation of solid products, showing a high degree of polymerization. This success was the result of a systematic study of the influence of high pressures on chemical reactions. The work was carried out in the laboratories of Imperial Chemical Industries in England. At first liquid systems were studied; later on gaseous systems were investigated (3, 6, 7, 9, 12).

[1] With Marbon Corp., Gary, Ind.
[2] Bibliography references appear at end of article.

The early work was carried out by Fawcett (5, 7), and a patent issued to him reveals that solid polymers of ethylene are formed: (a) by subjecting ethylene, compressed to at least 1,200 atmospheres, to a temperature of 100-300° C.; the temperature in any portion of the gas is prevented from reaching a point at which explosive decomposition occurs; or (b) by subjecting ethylene compressed to at least 500 atmospheres and accompanied by a small amount of oxygen not exceeding 3%, to an elevated temperature sufficient to induce reaction. Semi-solid or grease-like polymers are said to be obtained by the use of 500-1,200 atmospheres and temperatures of 200-400° C.

A United States patent, issued to Perrin (11), reveals a few more details:

The reaction, carried out above 500 atmospheres pressure, is very rapid; a sudden rise on the pressure gage is followed by rapid pressure drop. During this period 5-20% of the ethylene is polymerized, depending on the amount of oxygen present. Oxygen from 0.01-5.0% is used, depending on temperature and pressure employed. The conversion increases with oxygen to a certain limit, above which explosive decomposition is liable to occur. The more oxygen is used, the lower will be the ultimate molecular weight. Pressures should not exceed 3,000 atmospheres; temperatures should be kept between 150 and 250° C. The heat of reaction must be dissipated quickly.

High pressures are said to increase the molecular weight and accelerate the reaction; high temperatures lower the molecular weight. To remove the heat efficiently, the following measures are recommended: use of diluents; lining the reaction vessel with an alloy of high thermal conductivity; initiation of the reaction by an internal heating element exposed within the cold-walled vessel; and efficient stirring, either mechanically or by turbulent flow.

Recommended reaction conditions are:

Atmospheres	% Catalyst	Temperature not above
At 1,500	0.10	400°/C.
1,500	0.03-0.10	210°/C.

If the product is cooled under polymerization pressure, it is a fine white powder; but if the pressure is released at the reaction temperature, a tough solid is obtained with a softening point of about 120° C.

Among others the following figures are cited:

Oxygen %	Pressure Atmosphere	Molecular Weight	% Yield
0.01	1,500	18,000	6
0.04	1,500	12,000	9
0.07	1,500	10,000	10
0.13	1,500	6,000	25
0.21	1,000	5,000	6
0.63	1,000	2,500	20

Temperatures not given.

Ethylene containing 0.06% oxygen was compressed in a steel bomb to various pressures at temperatures up to 200° C. for two hours, giving the following results:

Pressure Atmospheres	Modecular Weight
500	2,000
1,000	8,000
1,500	6,000-12,000
3,000	12,000-24,000

Another United States patent, issued to Ellis (4), describes the formation of waxy solid polymers from ethylene by bringing ethylene into contact with a hydrogenation catalyst, such as reduced nickel on kieselguhr, and with an alkali metal hydride or alkali metal hydrocarbon compound, such as butyl-lithium, in which a univalent hydrocarbon radical is joined to the alkali metal through an aliphatic carbon atom.

Polyethylene is commercially produced in the United States and in England. It has not been disclosed what process is used, but it is reasonable to assume that the methods outlined in the patents described are followed to a great extent.

Chemical and Physical Properties

Owing to its saturated structure and the complete lack of any polar groups, polyethylene is very inert and offers resistance to oxidation and most chemicals (16). It is unaffected at room temperature by HCl, HNO_3, and 50% NaOH, but is strongly attacked by chlorosulphonic acid. At 100° C. it is still unaffected by HCl or 50% NaOH, but is attacked by nitric and sulphuric acids. It offers high resistance to ozone. When hot, polyethylene oxidizes in air, but antioxidants inhibit this tendency readily. The material can be chlorinated, producing rubbery to hard solids, depending on the chlorine content. The solubility of the present commercial product is low in most organic solvents at ordinary temperatures. Solubility increases fairly rapidly between 50-70° C., although very high molecular weight variations are not readily soluble in any solvent, even above the melting point. The softening point varies somewhat between 105 and 125° C., depending on the degree of polymerization. The properties of the material manufactured in this country are different from those encountered in England. In vacuum, polyethylene is stable up to 300° C., then a breakdown occurs, and waxes and greases are formed (16).

Physical characteristics of polyethylene include outstanding toughness and flexibility over a wide temperature range. On applying tension to a test specimen it elongates in a regular manner over the whole length until the stress reaches a critical value, normally about 1,000 kg/cm.^{2} At this point the specimen separates into two regions, the drawn and the undrawn, separated by definite shoulders. The ratio of cross-sections is said to be about 4 or 5:1 (16). Tensile strength, impact strength, and flexibility at low temperatures are improved by an increase in the average molecular weight.

High molecular weight polythenes have been produced which are flexible at —100° C. (16), but these materials are very tough and difficult to process on ordinary machinery. In a recent publication (14) the following properties have been listed for the material manufactured in this country:

Properties of American Polyethylene

Specific gravity	0.92
Tensile strength, p.s.i.:	
at – 70° F.	5,000
+ 77° F.	1,700
+170° F.	700
Elongation (77° F.) %	300-500
Modulus of elasticity (77° F.) p.s.i.	14,600
Flexural strength (77° F.) p.s.i.	1,700
Rockwell hardness	R-13
Flow temperature ° C.	104
Yield temperature ° F.	140
Spec. heat cal/gm/° C.	0.5
Coeff. of expansion per ° F.	10.5×10^{-5}
Thermal conductivity Btu/hr/sq. ft/° F/in.	2.96
Water absorption %	0.01
Flammability	Ignites and burns slowly
Outdoor exposure	No discoloration
Accelerated weathering	No discoloration
Resistant to	Water, alkalies, acids, and oxygenated solvents
Not resistant to	Chlorinated solvents, hydrocarbons at elevated temperatures
Dielectric const. 60 cycl.	2.3-2.4
Power factor 60 cycl.	0.0002-0.0005

Polyethylene can be compression or injection molded, and extruded (1, 16). High thermal expansion, about 12 to 14%, is, however, an appreciable handicap. Shrinkage during compression molding is high, and slow cooling under full pressure is essential to minimize the development of strains. For sound moldings temperatures of 250 to 300° F. are recommended. For injection molding cylinder temperatures of 400 to 500° F. and die temperatures of 140° F. should be used. In extruding polyethylene, extruders of the roller-feed type have apparently proved best in various instances (16). Barrel temperatures must be above the melting point of the material, and die temperatures should be between 280 and 320° F., depending on the liquid viscosities. After extrusion slow cooling is imperative. Too rapid cooling would harden the surface while the interior was still soft. When a plasticizer is used with polyethylene, such as polyisobutylene, such great care in cooling does not need to be exercised, and the material, moreover, can be handled more easily in many respects.

At this time polyethylene is available only for uses intimately connected with the war effort. One of its main applications is to be found in high-frequency wire and cable insulation; but as soon as it is released for the civilian market, there will be a great many industries making use of it. Among the many uses that suggest themselves are flexible and rigid tubing, various kinds of coatings, lacquers, and paints, molded products, textile fibers, and many, many more, unthought of today, but expanding tomorrow, as the great new world of plastic materials continues to grow at an unprecedented rate.

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(15) H. Staudinger, M. Brunner, and W. Feisst, *Helv. Chim. Acta*, 13, 827 (1930).
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Zinc Oxide Sales for Rubber Gain in 1943

Substantial improvement in sales of lead and zinc pigments as a whole in 1943 following the 1942 recession from high 1941 rates was reported by the Bureau of Mines, United States Department of the Interior, Washington, D. C. Zinc oxide (lead-free) made the largest gain, but this pigment had had the greatest percentage drop in 1942. The chief tonnage gain for all pigments was in the amount of zinc oxide used for chemical warfare purposes, followed by the increase in the quantity used for rubber manufacture. Sales of zinc oxide (lead-free) to rubber plants increased from 52,717 short tons in 1942 to 67,898 short tons in 1943. Litharge consumed by the rubber industry in 1943 totaled 4,302 short tons, compared with 3,460 short tons the year before. Lithopone used in rubber compounding was 1,078 short tons in 1943, contrasted with 1,047 short tons in 1942. Basic lead sulphate sales for rubber manufacture increased from 89 short tons in 1942 to 131 short tons in 1943.

Total sales of zinc oxide rose from 99,677 short tons in 1942 to 143,402 tons in 1943. Other sales in short tons were: litharge, 91,513 (1942) and 113,091 (1943); lithopone, 137,320 (1942) and 135,723 (1943); leaded zinc oxide, 48,128 (1942) and 43,828 (1943); and basic lead sulphate, 8,410 (1942) and 5,597 (1943).

Special Report of Office of Rubber Director on the Synthetic Rubber Program

Plant Investment and Production Costs[1]

E. R. Gilliland and H. M. Lavender, Jr.

OVER 95% of the plants in the synthetic rubber program have been built with the taxpayers' money. They are public property. The product of a certain percentage will be needed in the postwar period. Cost of operation of many will be so low that at the end of the emergency, decisions will have to be made as to how they are to be operated. It is hoped that enough will be operated so as to protect this nation against the danger of ever again being cut off from supplies of rubber. The economy of this country is geared to rubber—civilian transportation rolls on rubber; armies smash to victory on rubber; airplanes must have it, and, surprisingly, ships and navy equipment consume a large tonnage. Without the synthetic rubber now being produced in adequate supply, the war effort and victory would not be possible.

Introduction

Unused standby plants of the complex type required to make synthetic rubber and basic materials, deteriorate rapidly. Chemists and chemical engineers do not stand still — research discovers improvements constantly which call for changes in plant equipment.

Because the decisions that must be made involve several hundred million dollars of public property—taxpayers' property—I believe that every interested citizen should have available as a guide to his thinking all of the information now available to this Office as to plant investment and costs of making various synthetic rubbers. Consequently there is submitted herewith a report prepared by E. R. Gilliland, Assistant Rubber Director in Charge of Research and Development, and Harrison M. Lavender, Jr., of his staff, setting forth pertinent data.

The Secretary of Commerce, Jesse H. Jones, has furnished me with information on estimated costs and sales realization of natural and synthetic rubber as of June 30, 1944. Although this report covers only an interim situation in an ever-changing picture and will change with the ever-decreasing costs incident to making more Buna S from butadiene from petroleum rather than from alcohol, nevertheless I believe it will be of definite interest to those who will deal with the future of rubber. Under the direction of Mr. Jones, this nation collected a stockpile. This project was undertaken as early as 1940. Consequently purchases of crude, receipts of realizations, and costs of production of synthetic rubber are presented herein together with the analysis mentioned below as Appendix A.[2]

Many who study the data in this report will naturally wish to make similar studies of the costs of plantation-grown crude rubber. From these data and their own estimates of probable world demand for rubber in years to come, makers of such studies may or may not come to unanimous opinion as to the probabilities of postwar conditions and prices. Be this as it may, I feel that it is but proper that the public should have as much information as possible available to it. For this reason there is included as Appendix A a copy of an article by Everett G. Holt, entitled "Prewar Costs of Production for Plantation Rubber", which was prepared at my request. For many years Mr. Holt was Chief of the Rubber Division of the Department of Commerce and is now Chief of the Commercial Research Division of the Rubber Development Corp. This report gives valuable factual data as to prewar costs of crude rubber together with interpretative discussions relating these costs to certain of the world trends which necessarily affected them. It is presented with the understanding that the comments and conclusions in it are the personal opinions of the author, but it is believed that because of the author's long association with this field, his analysis will be of interest.

In submitting the above reports, it is emphasized that this Office is not responsible for the ultimate disposition of the plants in the rubber program and does not here speculate as to their future. However I am already on record as stating that I believe that the world demand for rubber after the war will be far greater than the capacity of the world's plantations before the war. This, together with the cost data presented herewith, leads me to the personal belief that not only will specialty rubbers be in demand, because of those qualities which are superior to crude rubber, but that Buna S will be in large demand at prices which will act as a governor and will set a ceiling on the world price of crude rubber. Further research will unquestionably improve the quality of all synthetic rubbers, and there is every reason to hope that the time will come when crude rubber will be inferior for many uses to then available synthetics.

Regardless of whether or not sufficient crude rubber may ever be available to supply the postwar world demand at prices less than the cost of synthetic—a situation which I cannot foresee—I cannot conceive under any circumstances of anyone considering scrapping the low-cost producers of the synthetic rubber program. But were this the case, the country would have to decide only whether it should subsidize or keep the synthetic plants in apple-pie standby condition ready to run.

However I believe the postwar world demand will be so large that there will be need of all the crude rubber present plantations can turn out and also the production of the low-cost producers of the synthetic rubber program—from 400,000 to 600,000 tons. There should be no duties or subsidies or international agreements. This country is today independent for its supplies of rubber of other nations, of the effect of wars between other nations, or the destruction of plantations by plant blights. It must so remain.

BRADLEY DEWEY
Rubber Director

August 31, 1944.

I. General Situation

To meet a national emergency the United States Government undertook the production of synthetic rubber and the main essential ingredients for its manufacture. In this program, monetary considerations were definitely secondary to obtaining a sure supply of synthetic rubber in the shortest possible time.

To insure the success of this program in almost untried fields, it included a variety of different processes for the production of raw materials as well as several different types of synthetic rubbers.

The following considerations were important in selecting processes:

1. The probable adaptability of the final product as a replacement for natural rubber.
2. The state of development of a process.
3. The availability of the basic raw materials necessary for the production of the polymer and the necessary intermediates.
4. Military and industrial needs of special polymers.
5. The estimated time of construction.
6. The use of certain critical materials.

On the basis of these considerations Buna S was chosen as the best general-purpose rubber and became the backbone of the program. Butadiene and styrene, the two principal ingredients of this polymer, were being produced on a small scale, and some of the technical problems concerned with their manufacture were known. In addition several companies had carried out extensive research and development work over a period of years in this field.

The second main synthetic chosen for the government program was Neoprene GN. This polymer had been produced on a commercial scale for almost a decade and had demonstrated its value as a synthetic rubber. However at the time neoprene was considered to be less suitable for general-purpose uses than Buna S, and it appeared that the production of the necessary raw materials would require certain facilities that were difficult to obtain. The program for neoprene was, therefore, limited to the need contemplated for products requiring its special characteristics.

Butyl rubber was also chosen for part of the program, but it was felt that although data indicated that it was a synthetic rubber of considerable promise, the experience in both its manufacture and use was so limited that it would be unwise to gamble a major portion on it.

These three synthetic rubbers form the real basis of the government synthetic rub-

[1] This article is based on cost figures submitted by Rubber Reserve Co. as supervisors of the government-owned synthetic rubber plants. Most of these plants were provided for by the program originally laid out by Rubber Reserve Co. and finished in accordance with the instructions of the Baruch Committee that they be "bulled through" to completion without further change.

[2] Appendix A will appear in a future issue of INDIA RUBBER WORLD.

TABLE 1. COMPARISON OF PRESENT RUBBER PROGRAM WITH BARUCH COMMITTEE RECOMMENDATIONS

A. SYNTHETIC RUBBER (LONG TONS)

	Rated Annual Capacities			Estimated Ultimate Annual Capacity with Present Plants	Estimated Annual Rate Fourth Quarter 1944,
	Baruch U. S. Only	Present U. S. Only	Present U. S. and Canada	U. S. and Canada	U. S. and Canada
(1) Buna S	845,000	705,000	735,000	1,000,000	780,000
(2) Butyl	132,000	68,000	75,000	75,000	38,000
(3) Neoprene GN	69,000	*63,000	*63,000	70,000	57,000
(4) "Thiokol" N	60,000		Program suspended		
Total	1,106,000	836,000	873,000	1,145,000	875,000

* Including 14,000 additional tons of neoprene plant capacity scheduled for completion during 1944.

B. BUTADIENE (SHORT TONS)

	Rated Annual Capacities		
From	Baruch U. S. Only	Present U. S. Only	Present U. S. and Canada
(1) Grain or alcohol	247,000	230,000	230,000
(2) Butane	60,000	75,000	75,000
(3) Butylene	250,000	250,000	280,000
(4) Naphtha	125,000	37,600	37,600
(5) Combination of 3 and 4	85,000	55,000	55,000
(6) Natural gas by aldol	.....	10,000	10,000
Total	767,000	657,600	687,600

ber program, but in the Summer of 1942 the uncertainties were so great that the Rubber Survey Committee recommended the production of a limited quantity of "Thiokol" N for retreading and passenger tire production. It was realized that "Thiokol" N was a specialty polymer having solvent resisting properties that made it extremely valuable for certain uses, but that it was not a rubber of high quality for general-purpose uses. Since the raw materials and facilities that could be easily adapted to the polymerization were readily available, the Baruch Committee recommended a capacity of 60,000 tons per year. It was later found that due to the effectiveness of various conservation measures adopted and a rapid increase in the production of reclaimed rubber, it was possible to meet the situation without the use of "Thiokol" N, and early in 1943 production as a general-purpose rubber was abandoned.

In Table 1 the resultant program is compared with the recommendations of the Baruch Committee. It will be noted in the table that there is considerable difference between the rated capacities of the present program and those recommended by the Baruch Committee. As the program was built, it became obvious that a number of the plants would be able to operate at over capacity and it was, therefore, decided that the necessary quantities of synthetic rubber could be made with plants of the rated capacities given in the table. The Butyl program was rerated from 132,000 to 68,000 long tons per year in recognition of the actual rate at which the plants are expected to operate with certain revisions and equipment additions over those contemplated at the time of the Baruch report. It will be noted that the rate of production of all synthetics for the fourth quarter of 1944 is less than the Baruch Committee recommendations; this is also less than the present productive capacity of the plants, but it is believed that the schedule corresponds to the probable consumption.

II. Synthetic Rubber Plant Investment

Table 2 gives the capacities, production, and the estimated investment for the various monomer and synthetic rubber plants in the government program. It is felt that the over capacity of these plants will be sufficient to produce synthetic rubber at the rates given in Table 1 for the ultimate capacities of the various synthetics. Private investment in synthetic rubber plants estimated to total less than $50,000,000 is not included in this summary.

It will be noted from Table 3 that the plant investment cost per ton of capacity for the three synthetic rubbers, Buna S, Butyl, and neoprene, indicates that the amount of equipment required is roughly the same. There are investments in private plants to produce such raw materials as alcohol, butylenes, naphtha, butane, ethylene, calcium carbide, soap, and other necessary ingredients which are not included in the above study.

III. Production Costs

While the investment and operating costs were not the major consideration in establishing the government program, these are very important in indicating the postwar possibilities of the various materials. Today the operation of most of the government-owned plants has progressed far enough that a reasonably accurate picture can be obtained of both the present production costs as well as those likely to be realized in the future.

The following cost analysis has been based on the out-of-pocket operating charges. It does not contain any provision for amortization, sales expense, profit, or interest on investment. However it does include plant insurance, taxes, nominal royalties and a small management charge to cover expenses which are not capable of direct allocation and which may or may not include some profit.

Amortization and interest on investment were not included in the considerations because of the uncertainty as to the basis on which the government will handle its investment. There are two points of view, one maintaining that synthetic rubber plants, like a battleship or a gun, are purely a war necessity and that the government should make no attempt to recover the full investment value. The other maintains that these plants are a going industry with possibilities of profitable operation after the war and should be disposed of as such. Those who are charged with the responsibility of their disposal will have to weigh the *pros* and *cons* in their decision as to what course is best for the national interest.

Because of the assured market for the products, selling expense to date has not been a major item in the rubber program. The uncertainties in this country's rubber policy are so great that any estimates of this item on a postwar basis are meaningless. The profits necessary to make the operation attractive are a function of the risks entailed in the private operation of the plants, and they, too, cannot be accurately evaluated for the same reasons that selling expense is uncertain. Therefore all of the costs in the following discussions exclude these four items, and the resultant cost is the direct or out-of-pocket cost.

TABLE 3

A. U. S. GOVERNMENT BUNA S

	Basis 1—Average Investment per Annual Ton Estimated Individual Actual Butadiene, Styrene & Copolymer Capacity ($/LT Buna S)	Basis 2—Average Investment per Annual Ton Estimated Actual Copolymer Capacity ($/LT Buna S)
Butadiene investment	$324	$380
Styrene investment	71	91
Miscellaneous chemicals and facilities investment	14	14
Copolymer investment	178	178
Total investment	587	663

NOTE. Basis 1 butadiene and styrene investments are less than Basis 2 since the ultimate capacities of the butadiene and styrene plants are greater than the ultimate capacity of the copolymer plants. If the full operation of these plants is made possible by outside sales, Basis 1 applies; if their production is limited solely to Buna S demand, Basis 2 applies. Basis 1 assumes 0.813-short ton of butadiene and 0.250-short ton of styrene are required per long ton of Buna S.

B. ALL U. S. GOVERNMENT SYNTHETICS

Synthetic	Investment per Long Ton Estimated Actual Capacity
Buna S, basis 1 above	$587
Buna S, basis 2 above	663
Butyl	779
Neoprene GN	717
Average all synthetics (Buna S on basis 2)	675

A. Neoprene GN

Table 4 presents the approximate current operating costs for Neoprene GN, together with an estimate of its possible postwar cost. This cost includes feedstock and direct operating costs, but excludes amortization, preliminary expense, and research. It will be seen from the table that the present costs average approximately 24¢ per pound of Neoprene GN, with acetylene purchased at 11.67¢ per pound. It has been estimated that acetylene may sell for approximately 7¢ per pound in the postwar market. This may result in reducing the cost neoprene to approximately 19¢ per pound. High as these costs may appear to be, Neoprene GN, as a result of its special properties, should play an important part in the future rubber field.

B. Butyl

The government Butyl program is comprised of two plants, one located at Baton Rouge, La., operated by the Standard Oil Co. of Louisiana, and the other located at Baytown, Tex., operated by Humble Oil & Refining Co. The Baton Rouge units have been in operation for up to 18 months, whereas the construction on the Baytown plant is still being completed. Major operating difficulties have been experienced with the Baton Rouge plant. These have necessitated an extensive research and development program, and major alterations to all of the units are being installed.

To date the maximum month's production for the Baton Rouge plant has been 41% of rated capacity. On the basis of

this reduced operation it will be seen from Table 4 that Butyl rubber is being manufactured for an average operating cost including feedstocks of 21½¢ per pound.

The above-mentioned research and development program, together with the alterations, should enable the Butyl plants to operate at capacities approaching rating. While it is not possible to predict accurately the ultimate costs on the basis of present experience, it is believed that Butyl rubber may be manufactured at an operating cost, including feedstocks, of 10 to 14¢ per pound. However its status as general-purpose rubber is still uncertain, and it will take large-scale manufacture, consumption, and use before its ultimate position is determined. In any event appreciable quantities of Butyl should be used as a special-purpose rubber for cases where it is superior to natural rubber.

C. Buna S

At the present stage of the program the

TABLE 2—SUMMARIZED RUBBER PROGRAM CAPACITIES, PRODUCTION AND INVESTMENT

Plant Location	Operator	Rated Capacity Tons/Year	Month of First Production	Total Production Through June, 1944 (Tons)	Maximum Month's Production to Date % of Rated	Estimated Ultimate † Actual Capacity % of Rated	Estimated † Investment Cost	Source ‡ of Funds	Investment ¶ per Annual Ton of Rated Capacity	Investment ¶ per Annual Ton of Estimated Actual Ultimate Capacity	Remarks
I. BUNA-S											
*A. Butadiene** (Capacities and Production in Short Tons)											
From alcohol:											
Institute, W. Va....	Carbide & Carbon Chemicals Corp.	80,000	Feb., 1943	151,190	201	180	$39,308,036	G	$491	$273	
Louisville, Ky.....	Carbide & Carbon Chemicals Corp.	60,000	Aug., 1943	74,800	181	180	35,731,028	G	595	330	
Kobuta, Pa.....	Koppers United Co.....	80,000	July, 1943	95,380	177	180	41,508,036	G	519	288	Kobuta project consists of 80,000 T/yr. butadiene plant and 37,500 T/yr. styrene plant costing $61,508,036. Cost of styrene plant is here arbitrarily set at $20,000,000, leaving $41,508,036 for butadiene.
Subtotal.....	.....	220,000	.....	321,370	...	180	116,547,100	G	530	294	
From butylene:											
Baton Rouge, La...:	Standard Oil Co. of Louisiana	15,000	May, 1943	20,600	156	150	8,600,000	G	573	382	Baton Rouge project includes pilot plant no longer in operation which is arbitrarily evaluated at $1,000,000. Total project estimated at $9,600,000.
Baytown, Tex.....	Humble Oil & Refining Co...	30,000	Aug., 1943	22,210	120	135	19,400,000	G	647	480	
Lake Charles, La....	Cities Service Refining Corp..	55,000	Aug., 1944	.....	...	100	17,000,000	G	309	309	
Port Neches, Tex...	Neches Butane Products Co..	100,000	Feb., 1944	18,180	106	135	58,686,196	G	587	436	Maximum month's production at Neches is for one of two units only.
Houston, Tex.....	Sinclair Rubber, Inc.....	50,000	Apr., 1944	3,580	63	135	31,500,000	G	630	467	
Subtotal.....	.....	250,000	.....	64,570	..:	128	135,186,196	G	541	422	
From naphtha and gas oil:											
Baton Rouge, La....	Standard Oil Co. of Louisiana	6,800	Mar., 1943	6,820	♯117	100	2,000,000	G	294	294	Purification plant of sufficient size to handle crude butadiene produced at El Dorado in addition to own production.
Ingleside, Tex.....:	Humble Oil & Refining Co....	7,000	Oct., 1943	4,180	♯95	100	4,100,000	G	586	586	Purification plant of sufficient size to handle crude butadiene produced at Corpus Christi in addition to own production.
El Dorado, Ark....:	Lion Oil Refining Co.....	6,700	Oct., 1943	§1,340	38	50	2,300,000	G	343	686	Crude butadiene production only.
Corpus Christi, Tex.	Taylor Refining Co.....	5,500	Apr., 1944	§70	11	25	1,800,000	G	327	1,310	Crude butadiene production only.
Subtotal.....:..	.....	26,000	.....	11,000	..:	71	10,200,000	..	393	553	
Combination from naphtha and butylene:											
Los Angeles, Calif...	Southern California Gas Co...	30,000	July, 1943	§10,860	81	100	13,500,000	G	450	450	Crude butadiene production only.
Los Angeles, Calif...	Shell Chemical Division.....	25,000	May, 1944	12,640	♯58	120	21,000,000	G	840	700	Purification plant of sufficient size to handle crude butadiene produced at Southern California Gas in addition to own production.
Subtotal.....	.....	55,000	.....	12,640	..:	109	34,500,000	G	628	576	
From butane:											
Borger, Tex.....	Phillips Petroleum Co.....:..	45,000	Sept., 1943	14,040	61	100	35,000,000	G	778	778	
El Segundo, Calif...	Standard Oil Co. of California	15,000	Apr., 1944	1,710 / ¶930	&74	125	7,700,000	G	513	410	
Toledo, O.....	Sun Oil Co.....	15,000	June, 1944	30	22	100	7,500,000	G	500	500	
Subtotal.....	.....	75,000	.....	15,780	...	105	50,200,000	G	670	638	
Total U. S. Government-owned butadiene plants	.....	626,000	.....	425,360	:..	139	346,633,296	G	553	398	
Other plants:											
Baton Rouge, La....	Standard Oil Co. of Louisiana	6,600	.....	.....	...	...	.....	P	....	....	Naphtha cracking process.
Charleston, W. Va...	Carbide & Carbon Chemicals Corp.	5,000	.....	.....	...	...	.....	P	....	....	Thermal cracking process.
Philadelphia, Pa....	Publicker Commercial Alcohol Co.	10,000	.....	.....	..	...	.....	P	....	....	Alcohol process. Not in operation.
Bishop, Tex.....	Celanese Corp. of America...	10,000	.....	.... ..	...	...	.....	P	....	....	Aldol process. Not in operation.
Sarnia, Canada.....	Imperial Oil, Ltd.....	30,000	.....	.....	...	...	.....	C	....	....	Butylene dehydrogenation process.
Subtotal.....	.....	61,600	.....	.....	...	...	.....	..	....	....	
Grand total butadiene plants	.....	687,600	.....	.....	...	...	.....	..	....	....	

* Private butadiene plants of Dow Chemical Co., Shell Chemical Division of Shell Union Oil Co., United Gas Improvement Co., Phillips Petroleum Co., and Standard Oil Co. of Louisiana in operation prior to the inception of the government program not listed.

† After completion of scheduled additions. The estimates which in some cases may be conservative are felt to correspond to the production rate over an extended period without sacrifice in product quality or plant efficiency. In case of need plants may operate at higher rates for short periods.

‡ G—U. S. Government; P—Private; C—Canadian Government.

¶ Basis for these figures is not comparable in all cases due to sizable utilities investments in some plants; whereas other plants purchase utilities directly from outside suppliers.

§ Crude butadiene produced for subsequent purification. These figures not included in totals.

♯ Does not include outside crude butadiene production purified in addition to own production.

& Applies only to specification butadiene produced; crude production purified elsewhere excluded.

most important evaluations of production costs are those for Buna S-type rubbers. It is the main general-purpose synthetic rubber and will probably be the chief competitor of natural rubber. For these reasons the following cost analysis is largely limited to Buna S and to its raw materials.

The main factors in determining the cost of the Buna S are:

1. The cost of the raw materials for the production of butadiene and styrene.
2. The direct operating costs of the syn-

TABLE 2. SUMMARIZED RUBBER PROGRAM CAPACITIES, PRODUCTION AND INVESTMENT—Continued

Plant Location	Operator	Rated Capacity Tons/Year	Month of First Production	Total Production Through June, 1944 (Tons)	Maximum Month's Production to Date % of Rated	Estimated Ultimate † Actual Capacity % of Rated	Estimated † Investment Cost	Source ‡ of Funds	Investment ¶ per Annual Ton of Rated Capacity	Investment ¶ per Annual Ton of Estimated Actual Ultimate Capacity	Remarks
B. Styrene (Capacities and Production in Short Tons)											
Velasco, Tex.	Dow Chemical Co.	50,000	Sept., 1943	30,120	117	175	$18,150,000	G	$363	$207	
Los Angeles, Calif.	Dow Chemical Co.	25,000	June, 1943	17,920	116	175	15,000,000	G	600	343	
Texas City, Tex.	Monsanto Chemical Co.	51,000	Mar., 1943	36,780	117	160	19,700,000	G	386	241	
Institute, W. Va.	Carbide & Carbon Chemicals Corp.	25,000	May, 1943	16,020	111	100	9,900,000	G	396	396	
Kobuta, Pa.	Koppers United Co.	37,500	Aug., 1943	20,950	102	140	20,000,000	G	533	381	
Total U. S. Government-owned styrene plants		188,500		121,790		154	82,750,000		439	285	
Midland, Mich.	Dow Chemical Co.	4,200						P			4,200 tons per year is amount contracted for by Rubber Reserve Co. Actual rated plant capacity is 10,000 tons per year.
Sarnia, Canada	Dow Chemical Co. of Canada, Ltd.	10,000						C			
Subtotal		14,200									
Grand total styrene plants		202,700									
C. Copolymer (Capacities and Production in Long Tons)											
Baton Rouge, La.	Copolymer Corp.	30,000	Apr., 1943	39,270	142	130	$7,536,853	G	$251	$193	
Borger, Tex.	B. F. Goodrich Co.	45,000	Aug., 1943	23,120	101	130	8,980,272	G	199	153	
Louisville, Ky.	B. F. Goodrich Co.	60,000	Nov., 1942	63,210	121	130	11,742,788	G	196	151	
Port Neches, Tex.	B. F. Goodrich Co.	60,000	Aug., 1943	25,000	114	130	16,584,896	G	276	212	
Akron, O.	Firestone Tire & Rubber Co.	30,000	June, 1942	45,370	142	130	6,639,247	G	221	170	
Lake Charles, La.	Firestone Tire & Rubber Co.	60,000	Sept., 1943	23,060	97	130	14,132,698	G	236	182	
Port Neches, Tex.	Firestone Tire & Rubber Co.	60,000	Nov., 1943	20,860	111	130	16,584,896	G	276	212	
Baytown, Tex.	General Tire & Rubber Co.	30,000	July, 1943	27,470	149	130	7,986,848	G	266	205	
Akron, O.	Goodyear Synthetic Rubber Corp.	30,000	May, 1942	35,620	143	130	7,666,247	G	256	197	
Houston, Tex.	Goodyear Synthetic Rubber Corp.	60,000	Oct., 1943	17,910	101	130	13,373,698	G	223	172	
Los Angeles, Calif.	Goodyear Synthetic Rubber Corp.	60,000	June, 1943	22,630	77	130	10,773,701	G	180	139	
Louisville, Ky.	National Synthetic Rubber Corp.	30,000	Oct., 1943	22,850	125	130	7,386,853	G	246	189	
Institute, W. Va.	United States Rubber Co.	90,000	Apr., 1943	94,170	136	130	18,560,550	G	206	158	
Naugatuck, Conn.	United States Rubber Co.	30,000	Sept., 1942	25,220	93	100	8,566,247	G	286	286	
Los Angeles, Calif.	United States Rubber Co.	30,000	Oct., 1943	11,590	113	130	5,386,850	G	180	139	
Total U. S. Government-owned copolymer plants		705,000		497,330		129	161,902,644	G	230	178	
Sarnia, Canada	Canadian Synthetic Rubber, Ltd.	30,000						C			
Grand total copolymer plants		735,000									
D. Miscellaneous, catalyst, chemical and other Buna S facilities							12,512,609	G			
Grand total U. S. Government-owned Buna S		705,000		497,330		129	603,798,549	G	857	663	
II. NEOPRENE-GN (Capacities and Production in Long Tons)											
Louisville, Ky.	E. I. du Pont de Nemours & Co.	54,000	Oct., 1942	50,120	126	111	43,000,000	G	796	717	Maximum month's production based on unexpanded capacity of 40,000 long tons per year.
Deepwater, N. J.	E. I. du Pont de Nemours & Co.	9,000						P			
Grand total neoprene		63,000									
III. BUTYL (Capacities and Production in Long Tons)											
Baton Rouge, La.	Standard Oil Co. of Louisiana	38,000	Mar., 1943	7,950	41	100	27,000,000	G	710	710	
Baytown, Tex.	Humble Oil & Refining Co.	30,000	Sept., 1944 (Est.)			100	26,000,000	G	867	867	
Total U. S. Government-owned Butyl		68,000		7,950		100	53,000,000	G	779	779	
Sarnia, Canada	Imperial Oil, Ltd.	7,000						C			
Grand total Butyl		75,000									
IV. ALL U. S. GOVERNMENT-OWNED SYNTHETIC RUBBER PLANTS (Capacities and Production in Long Tons)		827,000		555,400		125	699,798,549	G	845	675	

TABLE 4. NEOPRENE GN AND BUTYL PLANT OPERATING COSTS

[Cents per Pound of Product Including Feedstocks, but Excluding Amortization, Preliminary Expense, Research]

	Neoprene GN		Butyl
	Present Cost Acetylene @ 11.67¢/#	Postwar Cost Acetylene @ 7.00¢/#	Present Cost
1. Production materials:			
(a) Feedstocks	11.10	6.70	2.51
(b) Other chemicals	4.19	4.19	4.12
Sub-total	15.29	10.89	6.63
2. Utilities	1.33	1.33	1.71
3. Other costs:			
(a) Operating labor	1.50	1.39	3.51
(b) Supervision	0.13	0.13	0.20
(c) Repairs and maintenance	1.22	1.22	3.08
(d) Operating supplies	0.79	0.79	....
(e) Laboratory	0.30	0.30	0.92
(f) Packing and shipping	0.29	0.29	0.76
(g) Plant overhead	....	....	2.75
(1) Salaries, wages	1.29	1.19	.....
(2) Insurance	0.05	0.05	0.14
(3) Taxes	0.04	0.04	0.06
(4) Miscellaneous	0.40	0.40	0.25
Sub-total	6.01	5.80	11.67
4. Royalties and management fees	1.89	1.75	1.50
Total	24.52	19.77	21.51
5. By-product credit	—0.48	—0.40	.....
Total out-of-pocket	24.04	19.58	21.51

TABLE 5. BUTADIENE, STYRENE AND COPOLYMER PLANT OPERATING COSTS

[Cents per Pound of Product Excluding Feedstocks, Amortization, Preliminary Expense, Research]

Items	Butadiene				Styrene		Copolymer	
	From Alcohol		From Butylene (Dehydrogenation)					
	Present	Postwar	Present	Postwar	Present	Postwar	Present	Postwar
1. Chemicals (excluding feedstocks)	0.18	0.13	0.57	0.50	0.42	0.42	2.10	1.90
2. Utilities	.95	.75	1.20	1.20	.46	.46	.26	.26
3. Other costs:								
(a) Operating labor	.14	.12	.48	.44	.27	.25	.52	.45
(b) Supervision	.02	.02	.07	.07	.06	.06	.05	.05
(c) Repairs and maintenance	.19	.30	.62	.60	.23	.30	.40	.40
(d) Operating supplies	.04	.03	.15	.15	.01	.01	.02	.02
(e) Laboratory	.04	.03	.25	.25	.05	.05	.10	.10
(f) Packaging and shipping	.01	.01	.02	.02	.01	.01	.33	.25
(g) Plant overhead	....	....	.20	.20	....	....	....	....
(1) Salaries, wages	....	....	.20	.20	.16	.15	.33	.30
(2) Insurance	.02	.02	.06	.06	.03	.03	.03	.03
(3) Taxes	.02	.02	.01	.01	.01	.01	.08	.08
(4) Miscellaneous	.32	.27	.15	.15	.27	.27	.09	.09
Sub-total other costs	.80	.82	2.21	2.15	1.10	1.14	1.95	1.77
4. Royalties and management*	.51	.63	.65	.63	.68	.63	.52	.51
Total	2.44	2.33	4.63	4.48	2.66	2.65	4.83	4.44
5. By-product credit	—.23	—.14	....	....	—.14	—.14	....	....
Total out-of-pocket	2.21	2.19	4.63	4.48	2.52	2.51	4.83	4.44

* Management fee is scaled down with increased yearly production in a uniform manner for all producers.

thetic plants.

3. Amortization.

4. The geographic location of the plants.

Butadiene

The government butadiene program involves a number of different processes, but it can be divided into four main categories based on the feed stocks employed: (1) alcohol; (2) butylene; (3) butane; (4) naphthas or other petroleum fractions.

1. *Alcohol process.* So far, the greatest tonnage of butadiene has been produced from alcohol, and over the next six months it may still account for more than half of all production. It will be noted from Table 2 that the investment cost per ton of rated capacity is moderate, and when it is considered that the plants have operated at over 180% of rated capacity, the investment per annual ton butadiene, based on actual production, is less than $300. The alcohol butadiene program involves three plants containing 11 identical units, each having an original rated capacity of 20,000 short tons of butadiene. The process was developed, designed, and engineered by the Carbide & Carbon Chemicals Corp. Two of the plants contain four units each, one located at Institute, W. Va., operated by Carbide & Carbon, and one located at Kobuta, Pa., operated by the Koppers United Co. The third plant of three units at Louisville, Ky., is operated by Carbide & Carbon.

These plants have operated for over a year, and their production costs are well determined. Average production costs from the three plants above the cost of the alcohol feedstock for the butadiene are summarized in Table 5. The operating charges of approximately 2¢ per pound of butadiene are small in comparison to the cost of the alcohol employed, which for an ultimate yield of 2.25 pounds of butadiene per gallon of 190 proof alcohol, amounts to about 40¢ per pound of butadiene with the present alcohol price in the vicinity of 90¢ per gallon. Therefore the economics of the alcohol butadiene process are largely those of industrial alcohol production, and the resulting cost of the butadiene is given in Figure 1,[3] as a function of alcohol price. Estimates on industrial alcohol for large-scale consumption after the war have ranged from as low as 12¢ to as high as 20¢ per gallon. Using a somewhat optimistic price of 15¢ per gallon, the resultant direct cost of the butadiene is estimated to be 8¾¢ per pound.

2. *Butylene Dehydrogenation Process.* The main process for the production of butadiene in the petroleum field is based on the dehydrogenation of normal butylene. The process was developed by the Standard Oil Development Co. but has been modified and adapted by a number of operators using this process to fit different feed and product purification systems. The estimated operating costs for these plants above the cost of butylenes, as given in Table 5, are considerably higher than those for the alcohol butadiene plants. Consequently any reduction in these charges plays a much more important part in the cost of the butadiene produced.

At the present time the larger dehydrogenation plants have not achieved stabilized operation, and, therefore, their operating costs have fluctuated widely. For that reason the estimates given in Table 5 are based mainly on the cost data available on two of the smaller dehydrogenation plants. However they have been adjusted to some extent to reflect the expected ultimate cost for the larger units. An attempt has been made to forecast these operating costs for the postwar period, and the results are presented in the same table. The cost of the butylenes necessary to produce a pound of butadiene depends on both the market price of butylene and the ultimate level of the yields (utilization). Consequently in the Figure 2[3] the butadiene cost is presented as a function of the butylene utilization (pounds butadiene produced per pound butylene consumed) and the net cost of butylenes themselves. Currently butylenes range from about 8¢ to 12¢ a gallon, and the utilization ranges from 0.60 to 0.75. With 0.65 utilization and 9½¢ per gallon butylene (about present average value) butadiene costs approximately 7.6¢ per pound. In the postwar picture it should be possible with a utilization of 0.65 and butylenes available at 6¢ per gallon to produce butadiene by this process for as low as 6.4¢ per pound.

3. *Butane Dehydrogenation Process.* Three plants are included in the government program to produce butadiene from butane. One of these was developed and designed by the Phillips Petroleum Co., its operator, and the other two, utilizing the Houdry dehydrogenation process, are operated by the Standard Oil Co. of California and Sun Oil Co., respectively. Sufficient experience in stabilized operation has not been obtained on any of these plants to predict ultimate costs. However preliminary indications are that one or more of the plants will be able to produce butadiene competitively with the butylene dehydrogenation units.

4. *Naphtha Cracking Process.* The processes based on naphtha give a relatively small weight per cent. of butadiene (yields of 2½ to 5%), and, therefore, their economics involve the evaluation and disposal of a large number of other products. At the present time it does not appear that these processes will be competitive with some of the others except for a very small amount of production for which integrated facilities are available for the utilization of a high percentage of the by-products. It is unlikely that these naphtha processes will be a major influence in future butadiene prices.

5. *Summary.* To summarize, at the present time butadiene from alcohol costs approximately five times as much as butadiene from the low-cost butylene dehydrogenation. The cost of butadiene from alcohol will continue to be high as long as the price of alcohol is based largely on the cost of grain. If, in the postwar period, sufficient alcohol can be obtained synthetically from petroleum or from molasses or other low-cost agricultural products, this cost differential will close rapidly and the two processes would be competitive, if the prices of alcohol and butylene were approximately 9½¢ and 6¢ per gallon, respectively, or 15¢ and 13½¢, respectively. These prices of alcohol are somewhat less than are generally estimated for the postwar market, and on the basis of the present calculations it appears that the butylene and butane dehydrogenation plants will be the low-cost butadiene producers. However an improvement in the Carbide & Carbon process resulting in a higher yield of butadiene from a given quantity of alcohol or recovery of certain by-products which at the present time are credited at fuel value would make the picture for alcohol butadiene more favorable. In addition there may be a certain geographical advantage to the alcohol butadiene plants relative to the location of the petroleum

[3] Illustrations eliminated in interest of paper conservation. EDITOR.

TABLE

	Case I	Case II	Case III
Butadiene:			
Production cost	Butylene @ 6¢ gal. Utilization @ 0.65 In Texas....6.6¢/lb.	Alcohol—15¢/gal. In West Virginia..8.8¢/lb.	Butylene—6¢/gal. Utilization—0.65 In Texas....6.6¢/lb.
Shipping cost	0	0	Texas to Akron...0.80/lb.
Total CIF copolymer plant	In Texas....6.6¢/lb.	In West Virginia..8.8¢/lb.	In Akron....7.4¢/lb.
Styrene:			
Production cost	Ethylene @ 3¢/lb. Benzene @ 10¢/gal. In Texas....4.8¢/lb.		Ethylene—3¢/lb. Benzene—10¢/gal. In Texas....4.8¢/lb.
Shipping cost	Styrene Plant — Texas to Copolymer Plant—Texas 0.15¢/lb.		Texas to Akron 0.95¢/lb.
Total CIF copolymer plant	In Texas....4.95¢/lb.	In West Virginia..5.75¢/lb.	In Akron....5.75¢/lb.
Buna S:			
Production cost	Butadiene @ 6.6¢/lb. Styrene @ 4.95¢/ lb. In Texas....10.3¢/lb.	Butadiene—8.8¢/lb. Styrene—5.75¢/lb. In West Virginia..12.1¢/lb.	Butadiene—7.40¢/lb. Styrene—5.75¢/lb. In Akron....11.1¢/lb.
Shipping cost	Texas to Akron..0.75¢/lb.	West Virginia to Akron 0.33¢/lb.	0
Total CIF Akron..	11.05¢/lb.	12.43¢/lb.	11.1¢/lb.

butadiene plants in that they are more closely situated to the rubber consuming centers of the country.

Styrene

The styrene program as established was built largely around the Dow Chemical Co. process which had been in successful commercial operation for several years. In addition the Carbide & Carbon Chemicals Corp. used its own process, and two plants employed modified Dow systems. On the basis of present experience it appears that the Dow process will be the low-cost producer. These plants have operated very successfully and demonstrated their ability to give considerable overcapacity. Based on the operation of the Dow-type plants over the past several months, the styrene costs, exclusive of feedstocks, are listed in Table 5. Based on present yields, a nomograph for the cost of styrene is given in Figure 3[3] as a function of benzene and ethylene prices. At present ethylene is charged to the low-cost styrene plants at 6¢ per pound and benzene at about 16¢ per gallon, resulting in a styrene cost of approximately 6.6¢ per pound. Certain other plants obtain their ethylene by the dehydration of alcohol. This results in an ethylene cost of approximately 30¢ per pound, which with 16¢ per gallon benzene produces styrene costing 14¢ per pound. In the postwar picture it has been estimated that ethylene will be available at 2¢ to 3¢ per pound and benzene at 8¢ to 12¢ per gallon. Based on these prices, it should be possible to produce styrene for an out-of-pocket cost of 4¢ to 5¢ per pound.

Copolymer

With the exception of a few plants which were already engineered and under construction before the expanded government program was undertaken, the copolymer plants for the production of Buna S from butadiene and styrene are primarily of a standard design. In order to provide as nearly a uniform product as possible during the period when the conversion of manufacturing facilities from natural rubber to Buna S (GR-S) was taking place, every effort was made to run these plants by a standard operating procedure. As a result, the operating costs for the plants, once they have attained a full-scale operation, are quite uniform. A breakdown of these basic operating costs is presented in Table 5, together with an estimate of their probable postwar levels. These costs exclude the cost of the principal monomers, butadiene and styrene. It will be noted that the postwar estimate is approximately 0.4¢ per pound less than the present average. This is largely because of a reduction in the cost of chemicals other than monomers which enter into the polymerization formula. The remainder represents estimated possible savings in operating labor, i.e., changes in the packaging end of the plants, and other minor cost reductions.

The cost of the Buna S as a function of the butadiene and styrene cost is presented as a nomograph in Figure 4.[3] From the nomograph it can be seen that Buna S can now be produced for an out-of-pocket cost of about 12.2¢ per pound with styrene and butadiene at 7¢ and 8¢ per pound, respectively. (These are the approximate out-of-pocket charges for the present low-cost monomer producers). If the butadiene is made from alcohol at present prices, the out-of-pocket cost for Buna S is approximately 37¢ per pound. On a postwar basis it has been indicated above that it should be possible to produce butadiene and styrene at out-of-pocket costs of not over 7¢ and 5¢ per pound, respectively. These prices should make it possible to produce Buna S at an out-of-pocket cost of 10.7¢ per pound. Even if the butadiene cost were 9¢ per pound, as might be realized by the alcohol process, the direct cost of Buna S would be only 12.1¢ per pound. In all of the above costs, nominal management fees and royalties as listed only are included. The additional selling expenses, provisions for profit, interest charges on the use of private operating capital, increased royalties, and market risks may well increase the cost of both the monomers and the Buna S itself by several cents a pound, probably not less than 2¢ per pound nor more than 4¢ per pound. However no attempt was made to include these in the above studies.

Influence of Shipping Costs

Of general interest are a few calculations on the over-all operation from the raw materials at their source to finished rubber laid down in Akron. In Table 6 are presented estimates of the postwar cost for three cases. The first involves making the styrene, butadiene, and Buna S in Texas and shipping the finished rubber to Akron; the second involves starting with 5¾¢ styrene at Institute, W. Va., making the butadiene from alcohol and the Buna S at Institute, and shipping the finished rubber to Akron. The third involves the manufacture of the styrene and butadiene in Texas and shipment of them to Akron for polymerization. It is to be seen that the present tariff rates are such that Cases I and III give nearly the same cost for Buna S in Akron and that because of lower-cost butadiene both are about 1.3¢ per pound cheaper than Case II. However, all of the costs fall within a very narrow range, and factors at present unknown can well upset any one of the alternatives in favor of the others.

Gas Permeability of Coated Fabrics[1]

DURING World War I the National Bureau of Standards made a study of methods for determining the rate of passage of gases through balloon fabrics. Out of that investigation an apparatus was developed that afforded a rapid and precise measurement of permeability. In the intervening quarter of a century this apparatus has been in constant use, and it is a tribute to the Bureau's mechanical facilities that little of the original construction has needed to be altered or replaced.

In the present conflict the number and variety of inflatable structures has greatly multiplied. The barrage balloon is an established tool of defense. The performance of the non-rigid airship has convinced the most skeptical of its worth in coastal patrol. Rubber landing boats, pontoons, inflatable vests, and various types of life rafts have become essential equipment in warfare, much of which is amphibious.

In evaluating the coated fabrics entering into these structures the Bureau's method of determining permeability, applied under the direction of T. P. Sager, of the Chemistry Division, has performed a definite service. Information obtained in a systematic study of permeabilities of synthetic rubbers was of assistance when the necessity of substitution arose. The method has served as a standard for those employing other means of measuring permeability. It has been a general practice for manufacturers of fabrics to submit samples for the Bureau's determination; the test specimens employed are returned for redetermination in the manufacturer's apparatus.

The permeabilities of most types of synthetic rubbers are lower than that of natural rubber. The rate of permeation of GR-S or Buna S is, however, very nearly the same. It has long been known that different gases penetrate rubber at different rates. The permeability of rubber to helium is about two-thirds of its permeability to hydrogen. Carbon dioxide penetrates rubber at a rate 2.9 times that of hydrogen. A majority of the synthetic rubbers has approximately these same ratios. Rubbers of the Buna N type differ in having about the same rates for the three gases. In the case of GR-I or Butyl rubber and Vistanex the order is reversed: the permeability to helium is slightly greater than to hydrogen, and the rate of passage of carbon dioxide is about one-third that of hydrogen.

The explanation for this marked difference in behavior would appear to be a difference in the mechanism of permeation in the case of these materials. The higher relative permeability of natural rubber to carbon dioxide results from the greater solubility of this gas in rubber. In the permeation of Butyl rubber and Vistanex, both which are characterized by a high degree of saturation and hence are relatively inert, solubility of the gas must play a less dominant part in the process, and the mechanism becomes more nearly one of diffusion alone.

[1] *Tech. News Bull.*, National Bureau of Standards, Aug., 1944, pp. 57-58.

EDITORIALS

"It Must So Remain"

"THIS country is today independent for its supplies of rubber of other nations, of the effects of wars between other nations, or destruction of plantations by plant blights. It must so remain."

So said former Rubber Director Bradley Dewey in concluding his introduction to the "Special Report of the Office of the Rubber Director on the Synthetic Rubber Program—Plant Investment and Production Costs," issued under the date of August 31, 1944. This report, which was one of the last efforts of the Office of the Rubber Director, is the type that should be required of many other government war agencies when it is decided that the purpose for which they were created has been accomplished and their organizations are to be disbanded. It is a fitting supplement to the six progress reports that preceded it since it provides information on the total money—taxpayers' money—invested; the results achieved in the amount of synthetic rubber produced, and an estimate of the future prospects for the synthetic rubber plants built with government money, originally as an emergency war project.

As this report indicates, the government synthetic rubber program can and undoubtedly will become more than an emergency war project since the production of these plants will probably be needed for at least two years after the conclusion of the war with Japan to supply our own as well as other countries peacetime rubber needs. Of even greater importance is the estimate that synthetic rubber of improved quality and at costs in the neighborhood of 15¢ a pound including provisions for profit, interest charges on the use of private operating capital, etc., should be possible in the postwar period. It is not possible to estimate the added costs to private operators of amortization and interest on investment because government policy on disposal of the plants has not been decided upon.

Just what the situation with regard to the cost of natural rubber will be in the postwar period may also be estimated from Appendix A of the report which presents a discussion of "Prewar Costs of Production of Plantation Rubber," as prepared by an economist who has been for many years associated with this field. During the period 1935-38 the overall c.i.f. cost of production of all types of plantation rubber, not including producers' profits, was about 10¢ a pound, according to this study. The average cost to consumers in this country of plantation rubber during this period for all types and grades has probably never been calculated, but this cost may be approached by considering the prices averaged for annual periods by the U. S. Bureau of Labor Statistics for "plantation ribbed smoked sheets," as also given in this study. For the 1935-38 period this cost was 15.75¢ per pound. There is some reason to believe, therefore, that large volumes of both synthetic and natural rubber will be available and in real competition with each other some three or four years from now.

The next obvious consideration is just how, if it so desires, this country can maintain its new independence of rubber supply when, say in 1947-48, a large amount of both kinds of rubber is available and producers of natural rubber can, if they wish, supply rubber to the United States for a temporary period at least at costs much lower than 15¢ a pound. Maintaining synthetic rubber production at an adequate level no matter what the price of natural rubber is as a matter of national security has been generally agreed upon, but so has the necessity of maintaining a larger and more adequate military organization in times of peace in order to be better prepared for war; yet we have no real assurance that either will be accomplished. The world rubber situation is such that not only the United States, but other members of the Allied Nations will be mainly dependent on our synthetic rubber production for at least one year or possibly three more years. During this period we can use the present or future improved versions of government synthetic rubbers as "substitutes" for natural rubber and just mark time until natural rubber is again available in volume, or we can continue and accelerate our research on synthetic rubbers in order that, as Colonel Dewey puts it, ". . . the time will come when crude rubber will be inferior for many uses to the then available synthetics."

Also as crude rubber becomes again available in quantity, it will probably at first be of lower quality on the average than that used before the war. In their eagerness to use natural rubber again many manufacturers will find it hard to believe that a "low" quality natural rubber will not make better rubber products than a "high" quality synthetic rubber. Care will have to be exercised in using the first new large-volume supplies of natural rubber. If a high level of end-product quality is insisted upon, the final decision as to the amounts of either natural or synthetic rubber used in a given product or the products best made from natural and the products best made from synthetic rubbers will in all probability strike a balance in favor of an appreciable usage of synthetic rubber; and synthetic rubber production of sizeable proportions will be required to supply the demand.

Finally, in view of the uncertainty not only in this country, but in many countries of policy on international trade and with special reference to the effects of this future policy on our synthetic rubber industry, the most important requirement for maintaining our independence in rubber is a real confidence among users of synthetic rubber in synthetic rubber as a raw material. If we have this confidence, our independence is assured; if we do not have it, our return to the prewar problems of manufacturing many different products on a narrow-profit margin complicated by wide variations in the supply and cost of the essential raw material will be the very probable result. One thing that would mean as much as anything else to the rubber industry in the years to come would be a really stable rubber market. Confidence in synthetic rubber should insure such a market.

Scientific and Technical Activities

A. C. S. Meeting Attendance 9,000; Society Receives $15,000,000 Gift

ATTENDANCE at the one hundred and eighth meeting of the American Chemical Society in New York, N. Y., September 11 to 15 broke all previous records with a registration of more than 9,000. At the general meeting, September 13, James Bryant Conant, president of Harvard University, received the Priestley Medal, highest honor of the A. C. S., and Arthur C. Cope, associate professor of chemistry at Columbia University, received the $1,000 A. C. S. prize for outstanding research in organic chemistry. Dr. Conant, also chairman of the National Defense Research Committee, was honored for distinguished service to science and to the nation. The investigations of Dr. Cope have been of great value in the fields of plastics and drugs.

Besides Dr. Conant's medal address, other speakers at the general meeting were C. F. Kettering, of General Motors Corp., who discussed "The Effect of Molecular Structures in Fuels on the Power and Efficiency of Internal Combustion Engines", and Thomas Midgley, Jr., A. C. S. president, whose topic was "Accent on Youth."

In his address "Science and the National Welfare", in acceptance of the Priestley Medal, Dr. Conant stated that he accepted with pleasure and gratitude this significant award, not personally, but on behalf of the chemists of the United States who have contributed so greatly to the winning of the war. In his opening remarks Dr. Conant commented on the value of the practical application of science to the welfare of the nation and pointed out that without an adequate solution of the synthetic rubber problem we might well have lost the war and added that without a proper fiscal policy for the government we shall certainly lose the peace. As to the future of scientific research, it was stated that we must to some extent separate research in pure science from research and development in applied science, and that it is in our university laboratories and a few research institutes that the fundamental advances in physics and chemistry will be made, while in the applied fields we should continue the keen rivalry and competition between a number of strong and independent groups which now exist in the chemical industry. To insure a proper flow of scientific talent for all research, Dr. Conant suggested that the federal government institute a national scholarship program for young men who give promise of becoming leaders in science and technology. These scholarships should be awarded to members of the graduating class of the high schools through appropriate committees of a non-political nature in each state. The terms should include support on a modest basis through four to seven years of further education, and in return the recipients would agree to make themselves available in time of national emergency for national service under whatever conditions the government should then set. Industry was cautioned against raiding univeristy staffs of promising young professors, since it was from these workers that the fundamental advances in science later applied by industry were obtained, and secondly, it was among the graduates of the universities that industry had to look each year for trained men. The address was concluded with a plea for increased effort by scientists to keep the public correctly and adequately informed as to the purposes and achievements of their work as related to the national welfare since just as the national welfare depends on science, likewise, the future of science depends on the national welfare.

In his paper Mr. Kettering pointed out that two great industries of this country, those that do petroleum refining and those that make internal-combustion engines, both have a common technical meeting ground in chemistry, since what really makes the automobile and airplane function is simply a chemical reaction—but not necessarily a simple one. In explaining that the investigation of this reaction began with the necessity of determining the cause of engine knock at about the time of the introduction of battery ignition and the self-starter, it was stated that General Motors has been continuously exploring the relations between fuels, ignition systems, and engines ever since.

Reference was made to the use of anti-knock compounds, such as aniline and tetraethyl lead, and it was reported that from this work it became evident that two factors were most important: that the specific structure of the fuel greatly influences the knock; and that materials can be added to fuel of any structure and likewise influence the result. Subsequent research on fuels themselves showed still more definitely that the limitations of the fuel, from the viewpoint of knock-free power, resided not in the gross physical characteristics, but in its molecular structure, or the specific way in which a fixed number of atoms were grouped to form a molecule. Slides were used to show representative data on these structural relations for paraffins, aliphatic olefins, aromatics, six carbon ring naphthenes, five carbon ring naphthenes, alcohols, and various oxygen containing compounds. What the nature of the fuel limitation may be was specifically illustrated by examples, one of which charted the behaviors of the isomeric heptanes and one octane with respect to their relative freedoms from knock. Three things were emphasized from this study. First, there is a fairly regular increase in the individual critical compression ratios as the structure of the molecule of heptane becomes more closely centralized or highly branched. Second, the increase in critical compression ratio obtained by the addition of tetraethyl lead to each hydrocarbon becomes larger as the structure becomes more highly branched. The third and most important fact learned was the wide range of compression ratios covered. The outstanding thing about the heptanes is the behavior of 2,2,3,-trimethyl butane, or triptane. This material, made by Ethyl Gasoline Corp. and tested in gasoline solution in an engine in 1925, is so good that, when leaded, it is beyond the capacity of some methods of measuring its quality, as indicated by its relation to our present standard, isooctane, Mr. Kettering stated. The power obtained with leaded triptane is nearly three times as great as with isooctane, and a large-scale pilot plant to make up to five or ten barrels of triptane a day, built by General Motors, went into operation in January, 1944. Studies are under way to evaluate the commercial possibilities of triptane and related compounds, with some preliminary indication that the value of the fuel may justify the present projected cost per pound, which is relatively high as compared with fuels of lower quality. The future development of automotive and aircraft engines will depend upon how well management, as well as engineers and chemists, understand the fundamentals of the relation between fuels and proper engines, Mr. Kettering said.

Dr. Midgley in a semi-humorous vein reported on a study of the age factor in discovery and invention and stated that too many old men are at the helm in science, which needs the originality of youth to keep pace with its opportunities for service to mankind.

"Their retention is denying advancement to younger men at the very age when these younger men may be expected to be entering those years when their maximum efficiency will be attained. Earlier retirement ages or transfer for men engaged in work requiring originality is indicated," he said.

An unpublished Patent Office "Table of Important Inventions" was cited as evidence of youth's greater creativeness. Eighty-five inventions were listed, 46 of which had been granted to men 35 years old or less and 58 to men under 40. Dr. Midgley explained that he did not mean that men over 40 were of no use to society, but said that their usefulness is distinctly of a different nature from the usefulness of youth. His own generation has received an "unearned dividend" in life, and in accepting this unearned dividend in life, and a kind of youth, his generation was quite unconscious of the fact that in so doing it was encroaching, to an unjustifiable extent, upon the prerogatives which belong to youth. The life expectancy, statistically, has risen from 40 years at the time he was born until it is now 62 years. Dr. Midgley also argued, however, against the use of young professional chemists engaged in war production and research in the ranks of the Army in order to satisfy this requirement for youth.

"For genius and display, take youth; for cold calculation and planned execution take age," Dr. Midgely said in conclusion.

The Subscription Dinner

The subscription dinner, held in the grand ballroom of the Waldorf-Astoria Hotel on September 13, was featured by an address by Bernard M. Baruch on "Chemistry and the Future" and special announcements by Dr. Midgley and H. E. Riley, general chairman of the meeting and chairman of the North Jersey Section. Dr. Midgley announced that ownership of the Universal Oil Products Co., Chicago, one of the leading research and development companies of the country, would pass to the American Chemical Society under the terms of a gift according to which the income from this company, amounting to about $1,000,000 a year, will be used for research under the direction of the Society in the fields of science relating to the oil industry. Results of the research will be published and made available to the public without payment, and the donors will have no rights to such results greater than those of the public at large, it was stated.

Dr. Riley announced the institution of an award to be made biennially by the North Jersey Section and the Bakelite Corp., which will be known as the Leo Baekeland Award, to a chemist under 40 years of age who has made an outstanding contribution

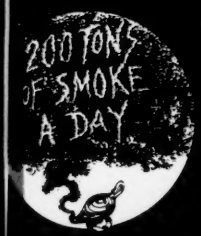
The BLACK *of* TODAY

STATEX

A COLUMBIAN COLLOID

CARBON FOR

GR-S TIRES



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STATEX-B
is a Reinforcing Carbon

It represents the first approach toward balancing the properties of carbon black to meet the specialized requirements of GR-S. Physicals approximate those of EPC with the advantages of:

DECREASED HEAT BUILD-UP
IMPROVED FLEX LIFE

Suggested for:

(1) Tire treads and carcasses
(2) Natural rubber and GR-S cushions for military and heavy duty tires
(3) GR-I tubes

STATEX 93
is the Balanced HMF Carbon

Reinforcement is maintained at a level consistent with markedly improved heat build-up and flex life characteristics. In addition Statex 93 compounds tube smoothly conforming closely to the die with minimum of shrinkage.

Suggested for:

(1) Tire treads for heavy duty service
(2) Blending with Micronex
(3) Extruded or calendered mechanical goods, footwear and cables.

STATEX TREADS WEAR OUT EVENTUALLY —THEY DO NOT CRACK OUT

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For 30 ye[illegible]

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to the knowledge of pure and/or applied science. The award will consist of a gold medal and $1,000 in cash and is given to commemorate the memory of the late Dr. Baekeland.

Mr. Baruch in his address paid tribute to Dr. Conant as recipient of the Priestly Medal and expressed his gratitude to both Dr. Conant and Dr. Compton for their help as members of the Rubber Survey Committee.

"I have always felt that it should have been called the Conant-Compton report," he said. "It was Drs. Conant and Compton who, with the scientists they chose, supplied the determining information for the whole undertaking—and then Jeffers, Dewey, and their associates magnificently bulled it through, and we are just squeaking by," he added.

As a result of his associations with scientists over a period of many years, Mr. Baruch said he was profoundly impressed with the need of a greater use of trained scientific, practical minds such as Dr. Conant's to help solve the many economic and social problems that face us.

"This struck me above everything in my contacts with Dr. Conant on the rubber program which covered political, economic, and scientific matters", he declared.

The speaker also mentioned his associations with other scientists, including Weidlein, Summers, Bogart, and Moody, and said that he hoped that the Office of Scientific Research and Development, headed by Dr. Vannevar Bush which has paved the way for many of the instrumentalities destroying our enemies, would be continued in peacetime. He further hopes that in the future, even in the fields of economic, political, and social matters, national and inter-national, more of these trained scientific minds, these experienced searchers after facts, truths, and realities, will be asked to help solve them.

Very enjoyable entertainment was provided after the dinner by a performance by Dunninger, "the master mind-reader", who extended his demonstration to include determination of chemical names and formulas found in the minds of some members of his audience.

Papers at Technical Sessions

Our September issue listed several papers considered of possible interest to rubber chemists and technologists. A review of some of these papers as well as others not previously listed has been prepared from abstracts of the papers and from observations made in hearing the papers as presented.

Papers Given before the Division of Paint, Varnish & Plastics Chemistry

"Polymerization of Vinyl Derivatives in Suspension."[1] Suspension polymerization of unsaturated organic compounds is carried out by dispersing and maintaining a dispersion of the monomer in water or other suitable liquids by high-speed mechanical agitation, adding a catalyst, and possibly a suspension stabilizer and maintaining the mixture at the desired temperature for the time required to reach the proper degree of polymerization. The rate of the reaction and the polymerization degree of the material produced depend on the average size of the globular particles, the concentration and nature of the initiating catalyst, and the temperature of the system. The reaction is considered as proceding in three stages: (1) formation of initiating complex in the dispersed monomer; (2) chain growth during which globules of polymer and monomer are both present; (3) termination of the chain growth at which time suspension consists mostly of polymer globules. In experiments with styrene, hydrocarbon soluble catalysts were found best; the amount of polymer formed was found related to the square root of the catalyst concentration, and it was concluded that polymerization in suspension was essentially a water-cooled bulk polymerization. In comparison with bulk polymerization under the same reaction conditions, greater per cent. conversion to polymer of a higher polymerization degree is obtained with suspension polymerization. Advantages over emulsion-type polymerization include freedom from contamination of the polymer with emulsifying agents and easily controlled temperature distribution. W. P. Hohenstein, F. Vingiello, and H. Mark, Polytechnic Institute of Brooklyn.

[1] India Rubber World, June, 1944, pp. 291-94, 300.

"The Structure of Copolymers." A general mathematical theory of copolymerization using the chain-growth concepts of Norris and Brookman has been developed involving relative polymerization velocities as functions of monomer composition. Two or more monomers produce a considerable degree of heterogeneity in polymers because of the different reaction rates of the monomers. Assuming that two kinds of monomers, X and Y, are involved, the growing polymer chains are characterized by the last added monomer unit. Accordingly four possible chain-growth steps are recognized: namely, X to X, X to Y, Y to X, and Y to Y. Slides were shown in which the relative polymerization velocities were plotted against composition and gave diagrams which assumed different forms depending upon the values assigned to the four specific reaction rate constants. The theory was developed in analogy with "Raoult's law" vapor pressure relation for binary systems. It was pointed out that non-ideal copolymerizations can sometimes lead to "azeotropic copolymers", homogeneous copolymers derived from constant polymerizing mixtures. The theory was suggested as useful in predicting the proper monomer concentrations to use to produce a given copolymer. Intramolecular architecture depends on the types of groups polymerizing. Frederick T. Wall, University of Illinois.

"Influence of Side Groups on Structure of Linear Polymers." Basic structural principles may be derived when vinyl polymers and condensation polymers are regarded as derivatives of *n*-paraffin chains such as polyethylene. The simplest chain packing of the extended, planar zig-zag paraffins is then progressively altered as other groups are introduced virtually within the chains (polyesters, polyethers, polyamides, etc.) or as side groups on it (vinyl polymers, $N\text{-}CH_3$ polyamides, etc.). The effects of permanent dipoles along the chain, of relatively high and regular substitution of side groups along the chain, of substitution continued so that on the average every carbon chain atom or at least every other one is altered, and the effect of lesser degrees of substitution on the packing of the chains were discussed. In conclusion it was stated that ordering of the main chains may be expected when the side groups are (1) especially numerous, (2) versatile in packing, and (3) small, but strongly interacting, as in polyvinyl alcohol and polyacrylonitrile. Higher than liquid order, within X-ray dimensions, appears when these side groups are large and specific in packing, such as in polyvinylcarbazole contrasted to polystyrene. W. O. Baker and C. S. Fuller, Bell Telephone Laboratories.

"Solubility and Solution Viscosity of Polyvinyl Ethers." Polymers of alkyl vinyl ethers are a relatively new class of plastic materials, which comprise from viscous liquid to relatively non-tacky rubber-like solids, depending upon the particular alkyl group and upon the polymer chain length. High polymers of *n*-butyl vinyl ether, one of which was called PVN-130, are of special interest in possessing, along with rubber-like elasticity and tack, complete solubility in a wide variety of organic solvents. Viscosities $\left(\frac{Nsp}{C}\right)$ were determined for this polyvinyl ether in more than 30 pure solvents, and wide differences in viscosity were found. Correlation between dielectric constants of the solvents and their ability to dissolve these polymers showed in general that good solvents had a dielectric constant below 20; while with non-solvents this constant was above 20. The variations of $\left(\frac{Nsp}{C}\right)$ with increasing concentration was reported for several polyvinyl *n*-butyl ethers and polyisobutylenes in cyclohexane, benzene, di-*n*-butyl ether, and in chloroform. C. E. Schildknecht, W. E. Hanford, and D. E. Stokes, General Aniline & Film Corp.

"Resinous Plasticizers Derived from Sebacic Acid." This paper presented a review of the use of resinous "polymeric" plasticizers derived from basic acid as compared with simpler, commonly used materials designated as "monomeric plasticizers", in polyvinyl chloride-acetate copolymer and Buna N rubbers. Compatibility studies were also made for GR-S, GR-M and "Thiokol" rubbers at various levels of plasticizer content. The new sebacic acid polyester plasticizer, known as Paraplex G-25, was indicated as having outstanding permanence, oil, solvent, and gasoline resistance, water resistance, heat stability, and low flammability. Properties, as milling time, Williams plasticity, heat loss, tensile strength, and oil and gasoline resistance of the polyester plasticizer in Buna N tire tread stock in comparison with dibenzyl and dibutyl sebacate, were given. K. K. Fligor and J. K. Sumner, Resinous Products & Chemical Co.

"Some Physical and Chemical Properties of Polythene." The properties of domestic polyethylene, described as a microcrystalline plastic resembling nylon, were presented. Curves for density and volume changes and specific heat with temperature were shown, and the excellent electrical properties and resistance to various chemicals pointed out. Polythene's position between regid plastics and GR-S on the stiffness scale was mentioned. Data were given to emphasize the dielectric constant and power factor values of this polymer and the stability of these values over a wide range of frequencies. It was stated that the power factor value would increase on milling, but this could be avoided by the use of an antioxidant. Shock cooling of the plastic produces transparency which is retained for about a year and a half. Many new uses for polythene, such as in special types of equipment, containers, gaskets, tubing, etc. were suggested, and the process of flame spraying the powdered material to protect metal surfaces from corrosion was described. Polythene was reported as not affected by concentrated hydrochloric, sulphuric, and hydrofluoric acids or alkalies at room temperature, but to be affected by oxygen, sulphur trioxide, and oxides of nitrogen at elevated temperatures. F. C. Hahn, M. L. Macht, and D. A. Fletcher, E. I. du Pont de Nemours & Co., Inc.

Papers before the Division of Physical & Inorganic Chemistry

"Gel Formation in Addition Polymerization." The polymerization of the systems methyl methacrylate-ethylene dimethacrylate and vinyl acetate-divinyl adipate was studied under a variety of conditions, and the extent of reaction at which the reaction mixture gels compared with that predicted by the Stockmeyer equation as given recently in the *Journal of Chemical Physics*. The agreement with theory was found to be qualitatively correct for these systems, but failed quantitatively in that gelation occurred several-fold too late at low polymer concentrations. Viscosity data used assumed that the polymer molecules were swollen and shaped as spheres. Contacts between the spheres were considered as dependent on the volume fraction occupied by them, and the relative viscosity was found to be directly related to the volume fraction when this ranged between 25 and 40%. Cheves Walling, United States Rubber Co.

"Molecular Weight and Weight Distribution Curves of High Polymers." A number of high polymers, as proteins, cellulose, cellulose acetate, rubber, gutta percha, polystyrene, and polyvinyl chloride, were investigated by various methods, such as osmotic pressure measurements (static and dynamic), viscosity determinations, ultra-centrifuge and light-scattering observations. In the case of fractions the molecular weights determined by the various methods checked within the limits of error of the experiments. The influence of concentration on such quantities as reduced osmotic pressure, specific viscosity, divided by concentration, and concentration divided by turbidity provides an interesting means of studying the solubility characteristics of the dissolved polymer and eventually may lead to conclusions about the average shape of the macromolecules in extremely dilute solution. It was mentioned that the limitations of light scattering methods due to non-symmetrical radiation introduces the necessity of correction factors. P. M. Doty, I. Meyerson, and H. Mark, Polytechnic Institute of Brooklyn.

"Some Experiments on the Mechanism of Copolymerization." Results of experiments with the copolymerization of styrene and a chlorinated styrene in bulk and in toluene solution in which rates of polymerization, average polymerization degree, and chemical constitution of the resulting copolymers were observed as functions of time were presented. It was pointed out that the growth step of a copolymerization reaction involves four distinct reactions which compete with each other for the monomer molecules and the continual changes in ratio of residual monomer concentrations and the fact that the copolymers formed at different stages of the polymerization are of different composition, as also described by F. T. Wall before the Division of Paint, Varnish & Plastics Chemistry at this same meeting, had been confirmed as far as the data available would permit. T. Alfrey, E. Merz, and H. Mark, Polytechnic Institute of Brooklyn.

Papers before the Division of Organic Chemistry

"Effects of Temperature on the Polymerization of Styrene." To gain information concerning the mechanism of the polymerization of vinyl compounds, and concerning the effects of temperature change on the individual steps in the polymerization process, the benzoyl peroxide catalyzed polymerization of a 3.46 molar solution of styrene in benzene at 54, 64, and 74° C. was studied. The polymerizations were carried out at the three temperatures at such initial peroxide concentrations that the rates of peroxide decomposition and thus the rates of formation of free radicals were identical at the three temperatures. The approximating assumption was made that under these conditions the rates of chain initiation were identical at the three temperatures, and the effects of temperature change on the polymerization which were observed, were due to the changes in the rates of chain propagation and chain transfer. It was found that both the rates of polymerization and the molecular weights of the products increased under these conditions with rise in temperature of reaction; the rates increased faster than the molecular weights. It was concluded that some chain transfer reactions may occur in these catalyzed polymerizations; chain transfer reactions may well be more important in thermal polymerizations, but data available for the thermal polymerizations of pure styrene are consistent with a reaction mechanism which does not include a chain transfer step. Saul G. Cohen, Pittsburgh Plate Glass Co.

"Relative Reactivities of Ethylene Bonds with Free Radicals. The Copolymerization of Styrene and Methyl Methacrylate." Reference was made at the beginning of this paper to the papers of F. T. Wall and of T. Alfrey, E. Merz, and H. Mark, presented before other divisions of the Society in which the equation for copolymerization of monomers of different reaction rates and the composition of the resulting copolymers were discussed. It was stated that the equation has been used for about two years and that the differential equation had been integrated and found applicable in the copolymerization of styrene and methyl methacrylate over a wide range of conversions and relative concentrations. Data obtained with 20, 50, and 80 parts of styrene and methyl methacrylate gave values of the two-rate constants of about 0.50. Monomer reaction rates were found to be dependent on temperature, type of monomer pair, and the mechanism of polymerization and independent of the composition of the feed, extent of reaction, and presence or absence of impurities. Each type of free radical prefers to react with the other monomer so that there is a tendency for the monomers to alternate in the copolymer. Frank B. Mayo and Frederick M. Lewis, U. S. Rubber.

"The Influence of Divinyl Derivatives on the Polymerization of Styrene." The preparation and properties of *p-p'*-divinyl diphenyl and *p-p'*-diisopropenyl diphenyl were first described; then the copolymerization of small quantities (10 to 100 p.p.m.) of these two materials with styrene was reported. Under these conditions soluble polymers were obtained, but if 1,000 p.p.m. of the divinyl derivatives were used, polymers which swell, but do not dissolve were obtained. The soluble copolymers were fractionated, and the distribution curves as a function of the amount of cross-linking agent were determined. The shape of these curves was found to depend upon the ratio styrene:divinyl derivative. The molecular weights and solubility characteristics of the various fractions were also determined. I. Valyi, A. Jensen, and H. Mark, Polytechnic Institute of Brooklyn.

Group Officers at Chicago Outing *(Left to Right)*: W. Bernstein, Secretary; B. Hubbard, President; J. Sheridan, Vice Chairman

"Dimerization of Styrene in Aqueous Solution." Reference was made to the similarity of the work presented in this paper to that given in the papers by J. R. Vinograd and others before the Division of Colloid Chemistry. High molecular weight polymers readily form from styrene in ordinary solvents as well as from styrene in emulsions containing soap. Styrene dissolved in soap solution, however, unexpectedly forms styrene dimer. A 2% aqueous solution of styrene will dissolve 0.65% styrene, and it was under these conditions that the reaction was studied. A special colorimetric analytical method employing the formation of stable dispersed manganese dioxide from a dilute solution of potassium permanganate was used to follow the reaction. The reaction was studied at four different temperatures, and from the data obtained an activation energy of 17,000 cal./mol. was calculated. This is appreciably lower than the 27,000 cal./mol. activation energy observed for the polymerization of styrene in solution in ordinary solvents. It was suggested that the reason for the unusual reaction in an unusual reaction medium might be the orientation of the styrene molecule within the micelles of the soap. V. J. Frilette, W. P. Hohenstein, and H. Mark, Polytechnic Institute.

Chicago Outing

THE annual outing of the Chicago Rubber Group at the Lincolnshire Country Club, July 22, was attended by 125 members and guests. The committee in charge included Charles Wonder, Van Cleef Bros.; J. Sheridan, New Jersey Zinc Co.; W. H. Lussie, R. T. Vanderbilt Co., Inc.; R. Elliott, Ideal Roller & Mfg. Co.; and R. Anschutz, Witco Chemical Co. Swimming, golf, cards, and other games were enjoyed throughout the day. The blind bogey golf prize, a $25 War Bond, was won by Mr. J. Sheridan, and the low gross prize went to W. Crumpler, George P. Mepham Corp. About 80 other prizes, contributed through the generosity of the following firms, were distributed:

Advance Solvents Chemical Corp.; L. Albert & Son; American Zinc Sales Co.; Bibb Mfg. Co.; Godfrey L. Cabot, Inc.; Carter Bell Mfg. Co.; Chicago Belting Co.; Chicago Cutting Die Co.; Cleveland Liner & Mfg. Co.; Commerce Petroleum Co.; Darling & Co.; Desmond Co.; Draft Chemical Co.; Farrel-Birmingham Co., Inc.; E. I. du Pont de Nemours & Co., Inc.; General Atlas Carbon; General Latex Co.; Geneseke Bros.; Great Lakes Solvents, Inc.; C. P. Hall Co.; Herron Bros. & Meyer; J. M. Huber, Inc.; Hycar Chemical Co.; Douglas P. Johnstone Co.; Geo. S. Mepham Corp.; Midwest Rubber Reclaiming Co.; H. Muehlstein & Co., Inc.; National Rubber Roller Co.; National Standard Co.; Naugatuck Chemical Division of United States Rubber Co.; New Jersey Zinc Sales Co.; Palmerton Publishing Co., Inc.; Pennsylvania Rubber Co.; Pequanoc Rubber Co.; Pittsburgh Plate Glass Co.; Rex-Hide Inc.; Henry L. Scott Co.; A. Schulman, Inc.; Sherwin-Williams Co.; Standard Chemical Co.; Stanco Distributors, Inc.; Sun Oil Co.; Thiokol Corp.; Titanium Pigment Corp.; United Carbon Co., Inc.; U. S. Rubber Reclaiming Co., Inc.; R. T. Vanderbilt Co., Inc.; Wilmington Chemical Corp.; Witco Chemical Co.; Xylos Rubber Co.

Photo by A. R. Hromatka

Los Angeles Rubber Group at Outing Dinner

Los Angeles Has G. I. Outing

THE annual summer outing of The Los Angeles Rubber Group, Inc., at the Uplifters Club, Santa Monica, Calif., July 22 and 23, was projected as "a day in the army" for the members attending. This unusual outing began with "induction" ceremonies Saturday afternoon. The Tlargi recruits donned army fatigue uniforms and marched to retreat and in the brief space of 24 hours became familiarized with tent inspection, court martials, mess calls, reveille, morning calisthenics, and many other routine duties of G. I. Joe. After a steak dinner, war films, games, and swimming, were entertainment features. Sunday morning breakfast was served camp fashion under the trees followed by popular contests. The golf pitch was won by Charles Lamb, trailed by H. Legman, C. McCormick, D. Good, and W. F. Vonder Reith. Elwood Lawless beat Paige Parker in the ping pong finals. H. Chamberlin scored in the tennis finals, and B. E. Biheller and D. Wineman were runners-up. Don Carr, J. Larkin, and Mr. Vonder Reith led in the badminton matches, and Mr. Parker won the horeshoe tournament, followed by R. W. Hemmin. George Steinback and Mr. Knudsen composed the winning team in the egg-toss; while V. H. Vodra and R. E. Carlson finished second. Winners in the "blind drill," a novelty contest led by Lt. Smith, were A. H. Subrin, W. E. Shawger, and F. Woerner.

After a mid-afternoon luncheon prizes were distributed to all attending, which were made possible through the courtesy of the following firms:

Hercules Powder Co., Inc.; Thiokol Corp.; J. M. Huber, Inc.; H. M. Royal, Inc.; Stanco Distributors, Inc.; T. A. Desmond & Co.; Western Shade Cloth Co.; H. Muehlstein & Co., Inc.; Godfrey L. Cabot, Inc.; W. C. Hardesty Co.; B. E. Dougherty Co.; American Turpentine & Tar Co.; Charles T. Wilson Co., Inc.; Reinke, Hiller & Amende, Inc.; Monsanto Chemical Co.; C. P. Hall Co.; General Atlas Carbon Division; L. H. Butcher Co.; Marine Magnesium Products Corp.; Stamford Rubber Supply Co.; A. Schrader's Son Division of Scoville Mfg. Co., Inc.; Farrel-Birmingham Co., Inc.; New Jersey Zinc Co.; A. Legman & Son; Binney & Smith Co.; E. I. du Pont de Nemours & Co., Inc.; Dill Mfg. Co.; National-Standard Co.; Hycar Chemical Co.; United Carbon Co., Inc.; R. T. Vanderbilt Co., Inc.; Wesp, Meldowney & Martin, Inc.; E. L. Royal; Montel Montgomery, of Martin, Hoyt, & Milne; and Commander Scott.

Hauser Speaks to Chicago Group

THE Chicago Rubber Group will meet at 6.30 p. m. October 20 at the Morrison Hotel, Chicago, Ill. After dinner the program will include papers by E. A. Hauser and D. LeBeau, of Massachusetts Institute of Technology. Dr. Hauser's subject is "Rubber Research at M. I. T.", and Dr. LeBeau will talk on "Some New Developments in the Study of the Structure of Rubber."

New Molding Process Viewed

THE Buffalo Rubber Group held its first meeting of the new season, September 21, at the Hotel Westbrook, Buffalo, N. Y. D. F. Fraser, manager of the rubber division, Monroe Auto Equipment Co., presented a paper, "A New Method of Molding Rubber—the Chrysler Rubber Injection Machine." The paper was prepared by the speaker and J. V. Hendrick, of Chrysler Corp., who was responsible for the laboratory development of the machine.[1] The meeting was adjourned after a short session of discussion and questions.

[1] For details see p. 87, this issue.

Northern California Outing

THE second annual summer outing of the Northern California Rubber Group at Tilden Regional Park, Berkeley, Calif., August 6, was attended by 140 persons including members and their families and guests. About 30 members participated in the golf tournament. Trophies were won by F. W. Swain for hole-in-one and by E. Munier for low score. Mr. Munier was also the winner of the blind bogey and of the dart game. Russell Kettering was first in the egg throwing contest, and Gene Foubert in the horseshoe pitching contest. First and second places in the swimming contest went to William Armstrong and H. J. Jordan. Mrs. Leonard Boller triumphed in the scavenger hunt, and Miss Joan Logett in the guessing contest. Frank Durbin was general chairman of the outing, and L. L. Shafer was prize committee chairman. Prizes distributed were through the generosity of the following firms:

L. H. Butcher Co.; Goodyear Tire & Rubber Co.; Farrel-Birmingham Co., Inc.; H. M. Royal, Inc.; Martin, Hoyt & Milne, Inc.; R. T. Vanderbilt Co., Inc.; Stanco Distributors, Inc.; Naugatuck Chemical Division, United States Rubber Co.; Shell Oil Co., Inc.; Shell Development Co.; Shell Chemical Co.; Thiokol Corp.; Hycar Chemical Co.; E. I. du Pont de Nemours & Co., Inc.; New Jersey Zinc Sales Co.; Marine Magnesium Products Corp.; C. P. Hall Co. of California; Standard Oil Co.; Pioneer Rubber Mills; Reliance Rubber Co.; California Cotton Mills; American Rubber Mfg. Co.; Plant Rubber & Asbestos Works; Oliver Tire & Rubber Co.; Imperial Paper & Color Corp.; Pacific Rubber & Tire Mfg. Co.; Oronite Chemical Co.

R. I. Group Meets November 3

THE Rhode Island Rubber Club, meeting November 3 at the Crown Hotel, Providence, R. I., will be addressed by R. A. Schotman, a former burgomaster of various cities in Netherlands India. His topic is "The Netherlands East Indies, before, during, and after the War."

"Thiokol" Type LP-2

THIOKOL CORP. recently announced the development of "Thiokol" type LP-2, an amber-colored, stable viscous liquid, low-polymer form of polysulphide polymer having the properties after cure of an elastomer of high molecular weight. Practically no shrinkage occurs during cure, and in the cure state LP-2 is said to be highly resistant to solvents and to have good low-temperature flexibility. Vulcanization at room or elevated temperatures is accomplished in periods of from 10 minutes to 24 hours by the simple addition of such vulcanizing agents as lead peroxide, red lead, litharge, zinc oxide, zinc chromate, hexamethylenetetramine, or furfural. The time of vulcanization may be widely varied by the choice of curing agent and temperature. In general five parts of lead peroxide will cure LP-2 at room or elevated temperatures. Relatively low molecular weight and the presence of reactive mercaptan terminals and side groups suggest the possibilities of compatibility of LP-2 with a variety of resins. It may be readily emulsified by ordinary emulsion procedures. Suggested uses include filling material in the isolation of parts against vibration or from one another, and sealant and caulking compound. In coating formulations it is claimed to be an excellent gasket and paper or cloth container coating, particularly in building a heavy coating or where solvent resistance or low-temperature flexibility is required.

Correction

ON PAGE 544 of our August issue, in reporting on "Synthetic Tires and New Vulcanization Methods Discussed" at the SAE meeting in Philadelphia, June 28, the following statement was made:

"Colonel Vogt's invention is now in use by the Army under front-line combat conditions. The 500-pound mobile military unit which occupies no more than a dozen square feet of space is replacing . . . equipment which takes hours to operate."

We apparently erred somewhat in our report of the use of this invention, and the following correction regarding its use is supplied by the Office of the Chief of Ordnance, Detroit, Mich.

"The induction heating in question is not used by the U. S. Army. Lt. Col. C. W. Vogt has demonstrated the equipment to engineers of the Ordnance Department and Air Forces who were sufficiently impressed with the possibilities of high-frequency curing that orders were placed for samples for development tests. These generators have not been received, but are due for delivery the latter part of August, 1944, when tests will take place to compare induction heating repairs with those made by present standardized methods."

UNITED STATES

Some Tire Production Increase Obtained; Rubber Reserve Takes Over Many ORD Functions

Heavy-duty tire production in Akron increased about 4% the last half of August in a report attributed to the Army Service Forces special tire unit in that city, and Bradley Dewey, the retiring Rubber Director, on September 3 stated that as a result of a survey made during the months of July and August, it was found that the August production of heavy-duty truck and bus tires was about 10% above schedule. For the third quarter of 1944, total production should be at least 12% in excess of the July 1 forecast. Colonel Dewey said also that additional equipment and facilities will be in place and ready to operate by the end of the third quarter, so that if additional manpower continues to be made available, it is expected that all essential military and civilian truck and bus tires will be produced during the fourth quarter.

Passenger-car tire production during July and August was reported below schedule. The summer production had been at a rate of 1,600,000 tires per month, but it was stated that there was every expectation that this production rate would improve so that allocations to the OPA will be at a rate which will fully satisfy demands of all B and C card drivers during autumn and winter. Manufacturers of other essential rubber products, such as self-sealing fuel tanks, tank blocks, mechanical goods, footwear, and hospital supplies, etc., have been able to produce at a rate which approximates essential requirements.

Other Tire Production Activities

The first joint union-management pledge to increase tire production during the present emergency was made to Gen. Dwight D. Eisenhower on August 25 by The B. F. Goodrich Co. and the Goodrich local union of the United Rubber Workers in a cablegram signed by George Bass, local union president, and T. G. Graham, Goodrich vice president. On September 2, E. H. Little, president of the Firestone local union, announced that a program designed to increase heavy-duty tire production was being presented to the members of his local. The program was outlined by a committee appointed to study the labor utilization survey made by the WMC at the Akron Firestone Tire & Rubber Co. plant.

On September 6, J. Monroe Johnson, ODT Director, issued a statement that fourth-quarter tire allocations by the WPB for October, November, and December were far below basic requirements on tires in sizes 8.25 x 20 and up. The 96,832 heavy-duty tires that can be made available through the rationing system each month during the fourth quarter fail by a substantial margin to satisfy replacement requirements of the services rated with top priorities 1 and 2 in the WPB and WFA essentiality list, it was said. Colonel Johnson also pointed out that when the critical shortage of the third-quarter was encountered, truck and bus operators had a reasonable volume of emergency reserves and spare tires, and the average condition of tires on running wheels had not deteriorated to an alarming degree. Now, however, he said, few operators have reserves, and a great many have utilized all their spares in order to keep their vehicles in operation.

Lieut. Gen. Brehon Somervell, commanding general of the Army Service Forces, in a Labor Day speech in Akron called upon tire workers to "improve even the splendid record you have made." The workers in Akron's tire industry already have accomplished a military mission of the highest order, but there still are not enough tires on hand in Europe to assure quick victory, the general added.

Special programs initiated by the WMC during August to find workers for the heavy-duty tire industry were markedly successful, Paul V. McNutt announced September 16. On August 1 the number of additional workers needed was 4,900, he explained, but by the end of the month, as a result of the special recruitment devices employed, only 1,640 of these most urgent jobs remained unfilled. About 300 workers were added at the United States Rubber Co., Chicopee Falls, Mass.; while in Akron, 1,200 workers were added. The Firestone and Seiberling companies there completely filled their orders and closed their recruitment itineraries. The Los Angeles area WMC has reported that hiring schedules can be comfortably met. Employment on tires and tubes, including passenger- and heavy-duty tires, totaled approximately 70,000 on August 1. About 65,000 additional workers were engaged in these same plants on other products, including fuel tanks, gas masks, life rafts, etc. Overall employment increased 1,100 during July and is scheduled to expand 11,500 more by October and an additional 4,200 by February, 1945. It was in connection with this last statement that Charles C. Miller, writing from Washington for the *Akron Beacon Journal*, reported that there was much doubt in Washington that the WMC could supply one-fourth of the 15,700 workers desired by next February.

A report from Akron on September 19, attributed to Maj. Charles Ballon, of the Army's heavy-duty tire special project team, stated that truck tire production in the nation jumped 15% between August 7 and September 16 and that production in Akron increased at the same pace as the national figure. Unfortunately on September 21 for the second time in three days 100 tire band builders at Plant 2 of the Goodyear Tire & Rubber Co. staged a walkout in protest against the delay of the War Labor Board on a wage dispute that has been under Board consideration since June. At the same time curing room workers on September 20 and 21 sat down in protest against a new piecework rate, but returned to work on the third shift September 21.

WPB Rubber Bureau Established

Under the date of September 2, it was announced that the President had signed Executive Order 9475, effective September 1, abolishing the Office of the Rubber Director as previously established by Executive Order 9246, dated September 17, 1942. The authority and functions of the Rubber Director were transferred to the WPB chairman except for those made the responsibility of the Rubber Reserve Co., under the direction of the Secretary of Commerce. These responsibilities were listed as: (a) purchase, sale, acquisition, storage, and transportation of synthetic and natural rubbers in amounts determined by the WPB chairman to be necessary to meet the requirements of the nation's rubber program; (b) research, development, and testing of synthetic rubbers and new monomers therefor and the testing of tires and tubes made therefrom by test fleets owned by or operated for the government, financed by or conducted in cooperation with Rubber Reserve; (c) subject to directives of the WPB chairman, operation of plants of the synthetic rubber program owned by Defense Plant Corp. or Rubber Reserve or operated under contract with either of them, except those which are within petroleum refineries.

It was further stated that all regulations, rulings, and other directives relating to the rubber program issued under Executive Order 9246 shall remain in effect except insofar as they may be amended by the WPB chairman and that nothing in the order shall be construed to limit the powers conferred upon the Price Administrator by the "Emergency Price Control Act of 1942," as amended.

Also on September 2, J. A. Krug, acting chairman of the WPB, announced that a Rubber Bureau had been set up within the WPB with James F. Clark as director. Mr. Clark had been with the ORD since December, 1942, and had been assistant deputy director since October, 1943. From 1925 to 1942, Mr. Clark was associated with W. G. Clark & Co., jewelry maufacturer of North Attleboro, Mass., and its successor, the Clark Lighter Co., of which he was vice president and director until 1935, when he became associated with Hemphill, Noyes & Co., investment banker in New York. From April until December, 1942, he was with the Foreign Funds Control of the Treasury Department.

Mr. Krug also said that L. D. Tompkins, former deputy rubber director, would act as a consultant to him and to Mr. Clark in connection with the operations of the Rubber Bureau, and that he had asked Colonel Dewey to head a committee which would serve from time to time upon request as advisors on any problems that may arise in connection with inter-agency relations as well as technical problems pertaining to all phases of synthetic rubbers and their uses. This committee will be made up of Colonel Dewey, chairman; Mr. Tompkins, E. R. Gilliland, E. B. Babcock, and C. C. Monrad. Mr. Krug paid tribute to the important services to the war effort of Colonel Dewey, who became deputy rubber director on September 29, 1942, and succeeded William M. Jeffers as director on September 15, 1943. Mr. Krug emphasized that with these men available for consultation he expected that there would be no interference with operations incident to the rubber industry and that it would be possible for the new Rubber Bureau to place every emphasis upon the necessity of obtaining at once the maximum number of heavy-duty tires so vital at this time to the whole war program.

Mr. Krug also took steps to maintain the *status quo* regarding rubber industry cooperation with the WPB by informing the Attorney General on August 31 that he had requested all manufacturers of synthetic rubber and of rubber consuming products to collaborate, under the direction and supervision of the WPB and Rubber Reserve Co., in the exchange of technical information and in the furtherance of technical improvements, research, developments, and testing of synthetic rubber and rubber-consuming products. Such information will

be made available to such persons and in such manner and to such extent as may be prescribed by WPB or Rubber Reserve, it was said.

Rubber Reserve on September 13 stated that as a result of Executive Order No. 9475, supervision of the activities of the U. S. Government Tire Test Fleet, San Antonio, Tex., had been assumed by the Rubber Reserve. The management and personnel of the Fleet both in Washington and San Antonio, will continue exactly the same as in the past. The purpose of the Fleet will be to evaluate synthetic rubber polymers in tires and tubes, to evaluate special compounding methods in synthetic rubber, to evaluate new compounding ingredients in synthetic rubber, and, in special cases, to evaluate certain other component parts of synthetic tires and/or tubes. No tests will be undertaken unless considered important in the broad advancement of the synthetic rubber program in its relation to the war effort.

More detailed information on the personnel of the new Rubber Bureau was not available from Washington late in September, nor was information obtainable regarding the reorganization of Rubber Reserve in light of its taking over much of the work of ORD in connection with operation of the government synthetic rubber plants and with the research and development program being carried on with synthetic rubbers. It is hoped a report on both the WPB Rubber Bureau and Rubber Reserve with special reference to their revised organizational set-ups can be presented next month. It is understood that the resignation of former Assistant Rubber Director E. R. Gilliland became effective about October 1 and that certain members of his division have joined Rubber Reserve where a research and development section is being organized.

Dewey's Final Report

As promised in Progress Report No. 6, Rubber Director Dewey issued under the date of August 31 a "Special Report of the Office of the Rubber Director on the Synthetic Rubber Program—Plant Investment and Production Costs." Appendix A covers "Prewar Costs of Production for Plantation Rubber," a study prepared at the request of ORD by Everett G. Holt, chief of the Commercial Research Division of Rubber Development Corp. and formerly chief of the Rubber Division of the Department of Commerce.

The report on the synthetic rubber plants and production costs was prepared by E. R. Gilliland, assistant rubber director in charge of research and development, and Harrison M. Lavender, Jr., of Gilliland's staff. This report will be found in this issue of INDIA RUBBER WORLD; while the report of Mr. Holt will appear in future issues. In an introduction to his Special Report, Colonel Dewey stated that the information was presented to guide the thinking of every citizen on decisions which eventually must be reached involving several hundred million dollars of public property, as represented by the synthetic rubber plants.

Figures on "Estimated Costs and Sales Realization of Natural and Synthetic Rubber", as provided by Rubber Reserve for the period between July, 1940, and June 30, 1944, conclude the report and reveal that Rubber Reserve for the period covered purchased 882,218 long tons of crude rubber at an average cost of 25.6¢ a pound and sold 789,020 long tons at an average price of 21.9¢ a pound. Rubber Reserve realized an average price of 25.1¢ a pound for the rubber sold, however, by virtue of the 17½¢ per pound payment made by the War and Navy departments, the Maritime Commission, and the Treasury Procurement on the synthetic and natural rubber reported to have been used in articles manufactured for War orders. Government synthetic rubbers produced and purchased during this same period totaled 556,542 long tons, the average cost of which was given as 34.4¢. Sales amounted to 523,880 long tons, and the average selling price was given as 22.9¢. Here again, however, Rubber Reserve reported a sales realization of 27.4¢ a pound. Production costs for the period covered were listed as 35.2¢ a pound for GR-S (Buna S), 26.7¢ a pound for GR-M (neoprene), 35.6¢ a pound for GR-I (Butyl), and 42¢ a pound for a small amount of GR-P ("Thiokol") made at the beginning of the program.

Harris & Ewing

James F. Clark

CALENDAR

Oct. 3.	Los Angeles Rubber Group, Inc. Mayfair Hotel, Los Angeles, Calif.
Oct. 3-5.	National Safety Congress and Exposition. Chicago, Ill.
Oct. 5-7.	SAE National Aeronautic Meeting and Engineering Display. Biltmore Hotel, Los Angeles, Calif.
Oct. 6.	New York Rubber Group. Building & Trades Club, New York, N. Y.
Oct. 6.	Boston Rubber Group. Hotel Vendome, Boston, Mass.
Oct. 16.	Ontario Rubber Section. Royal York Hotel, Toronto, Ont., Canada.
Oct. 20.	Chicago Rubber Group. Morrison Hotel, Chicago, Ill.
Oct. 26.	Northern California Rubber Group.
Nov. 3.	Akron Rubber Group. Mayflower Hotel, Akron, O.
Nov. 3.	Rhode Island Rubber Club. Crown Hotel, Providence, R. I.
Nov. 7.	Los Angeles Rubber Group, Inc.
Nov. 15.	N.A.W.M.D. Pacific Coast Division, San Francisco, Calif.
Nov. 17.	Chicago Rubber Group.
Nov. 27-Dec. 2.	Sixteenth National Exposition of Power & Mechanical Engineering. Madison Square Garden, New York, N. Y.
Dec. 5.	Los Angeles Rubber Group, Inc.
Dec. 15.	Chicago Rubber Group. Annual Christmas Party.

Brazilian and British Officials Visit Akron

Brazilian industrial and government officials visited Akron synthetic rubber plants during September to determine if Brazil might use more synthetic rubber and thus be able to send more natural rubber to this country. The mission, headed by Francisco Joao Maffei, chief of the chemical section of industrial production for the Government of Brazil, visited the Firestone and the Goodyear plants as well as other factories in the Akron area. Dr. Maffei emphasized the fact that passenger-car tires are made entirely of natural rubber in Brazil and said that this was one example of how this country could use more American synthetic rubber.

Another visitor to Akron synthetic rubber and tire plants last month was Oliver S. Franks, of the British Ministry of Supply. Mr. Franks, in this country on a special mission, sat as chairman of the British-Dutch-American rubber conference in London during August. A. L. Viles, president of The Rubber Manufacturers Association, Inc., who accompanied Mr. Franks to Akron, was reported as stating that a second international rubber coference might be held in this country in November.

Rubber Industry Postwar Years Discussed

A series of articles in the *Akron Beacon Journal* during September on "Postwar Akron" by Ray C. Sutliff contained some thoughts which might be considered applicable to the whole rubber industry and are therefore repeated here. The postwar years can be divided roughly into two periods, it was said. First will come the "catch up" period, when the rubber companies will go full blast and will find a ready market for every tire and tube they can produce. Then will come the long-pull period, when the shaving of a cent here and a nickel there on tire production costs will mean the difference between profit and loss. That is the period that the tire manufacturers are looking to as they prepare their long-range plans and make decisions that will have a tremendous influence on Akron's future. The major units of the rubber industry are making their postwar production plans on a national and international basis and not on an Akron community basis. A huge supply of new, government-owned war plants are scattered throughout the country, some of which might be available at postwar prices and be adaptable to new tire production methods and machinery. The source of raw materials, chiefly synthetic, and the development of new industrial marketing and distribution centers form a strong trend toward the Midwest and the Southwest. On high wage rates there is a feeling among industrialists that the company that goes into the postwar, long-pull period with a large portion of its production of tires coming from high-cost plants will be at a distinct disadvantage in the fight for sales. Many other items, mostly dealing with the problems from an Akron area viewpoint, were included in the articles, but the above points are believed to be the most pertinent as applying equally to the industry as a whole.

Rubber Development Corp. Head Resigns

The resignation of Douglas H. Allen as president of Rubber Development Corp., effective October 1, and the appointment of Francis Adams Truslow, R. D. C. vice president, as successor to Mr. Allen, were announced September 8 by Leo T. Crowley, Foreign Economic Administrator and chairman of the board of R.D.C. Mr. Allen will continue as a director of the corporation. Mr. Crowley paid tribute to Mr. Allen and his associates for having done a superb

job for the country in producing and procuring enough natural rubber from abroad to meet urgent military needs and said that they had made a vital contribution to the war effort.

Mr. Allen said in his letter of resignation, "If it were not for urgent private reasons, I would be glad to continue as president of the R. D. C. Regardless of these considerations, I would not feel free to withdraw, having in mind the continued urgent need for natural rubber, if it were not for the fact that a good field organization has been built up and that competent and experienced management is available in Washington to direct the operations of the corporation."

Mr. Allen reported that the total amount of natural rubber acquired from Latin America and Liberia combined during the period April 1, 1942, when procurements under the rubber agreements started, to August 31, 1944, was approximately 222,400,000 pounds, or about 101,000 long tons. The average cost on the gross disbursement basis was approximately 69¢ a pound. The total quantity of natural rubber acquired in Latin America was 151,200,000 pounds, or somewhat under 69,000 long tons, and the average cost was given as 88¢ a pound. The cost for all rubber delivered from Latin America between April 1, 1942, and December 1, 1946, was estimated at 72¢ a pound. Rubber acquired from Liberia during the April, 1942, to August, 1944, period was given as 71,200,000 pounds, or 32,000 long tons. This plantation rubber had an average cost of 28¢ a pound. Present indications are that production of rubber in Liberia and in Latin America for the 1944 season will be substantially higher than for the producing season of 1943, Mr. Allen stated.

United Rubber Workers' New York Meeting

At its national convention held in New York from September 18 to 22, the United Rubber Workers Union, C.I.O., reaffirmed its "no strike" pledge after a heated debate in which a group headed by George Bass, president of the Akron Goodrich local, opposed continuation of the pledge. The vote was 782 in favor of continuing the pledge and 375 against. Sherman H. Dalrymple, of Akron, was reelected president of the union for the tenth consecutive year by a vote of 756 to 394. The union's 1944 policy statement urges modernization of the "Little Steel" wage formula to permit wage increases equal to actual increases in living costs and urges Congressional support of the Wagner-Murray-Dingel, the Kilgore, and the Scanlon-Dawson bills. The policy statement further urges support of the fourth term for President Roosevelt and participation of organized labor in the world peace conference. It expresses confidence in C.I.O. president, Philip Murray, and in Sidney Hillman, chairman of the C.I.O. Political Action Committee.

Blaw-Knox Co., designer and engineer-contractor of the quintuple project, Pittsburgh, Pa., last month announced that five synthetic rubber pilot plants are now under construction for leading rubber companies and are expected to reach completion early in the new year. Development of new types of synthetic rubber polymers for further improving automobile tire and other synthetic rubbers is the overall purpose of the pilot plant installations. Plants are being built for Firestone Tire & Rubber Co., Akron, O.; Goodyear Tire & Rubber Co., Akron; United States Rubber Co., Naugatuck, Conn.; Copolymer Corp., Baton Rouge, La.; and National Synthetic Rubber Co., Louisville, Ky.

OPA Revises Several Rationing and Price Orders

Tire quotas for September underlined the continued necessity of large-scale recapping.

Principal changes from the August quota were an increase in heavy truck tires and a decrease in passenger-car and motorcycle tires. Quotas of the other three types of tires were unchanged.

The cut in passenger-car and motorcycle tire quota did not indicate any corresponding cut in eligibility, but presented a still more difficult job for local War Price and Rationing Boards in deciding who among the many applicants for new tires are the most essential drivers. Even with the much higher quotas in effect for July and August, boards were not able to keep up with demand. The reduced September quota gave boards very little margin over current replacement needs with which to catch up on the accumulated backlog of applications standing at about 1,000,000 tires. According to the ORD, passenger-car tire inventories, built up during last winter for release during the summer, have been used in the larger quotas released for June, July, and August. Thus it is now necessary that issuance and production be kept in balance.

OPA also emphasized that the increase in the heavy-truck tire quota will help, but will not entirely relieve the critical shortage of these tires. For several months allocations have been substantially below the minimum of 165,000 heavy truck tires that ODT estimates is needed each month to maintain commercial transportation. As a result, a large backlog of unfilled need has built up, and current quotas are not large enough to meet current demands, much less help relieve the accumulated backlog. It is expected that the OPA Emergency Tire Panel Boards, set up in July to process applications for heavy truck tires, will continue for several more months. The carrier essentiality list, used as a guide by these panels, will also have to be continued in use, OPA said, until allocations increase substantially.

Following is a tabulation of September quotas and reserves by types of tires. Figures for August are also shown for purposes of comparison.

Type of Tire	Quota Allocation	Reserve	Total Quota	August Quota
Passenger and Motorcycle: Grade I (new tires)	1,488,000	112,000	1,600,000	1,950,000
Truck and Bus: Size 7.50 and smaller...	254,400	25,600	280,000	280,000
8.25 and larger....	85,000	17,000	102,000	85,000
Tractor-Implement: Size 7.50 and smaller...	41,400	13,600	55,000	55,000
Larger than 7.50.....	18,400	4,600	23,000	23,000

The following amendments were added last month to RO 1A—Tires, Tubes, Recapping and Camelback. No. 84, effective September 11, provides that only an Emergency Truck Tire Board may issue a certificate for a truck tire with a cross-section 8.25 or larger; that an applicant may be granted a certificate for a used truck-type tire for a tractor only when the vehicle cannot be operated with a tractor-implement or a Grade III tire for such a vehicle; and that in areas where recapping facilities are inadequate, an applicant may be granted a certificate for a small tractor-implement tire or a Grade III tire for such a vehicle even though the tire to be replaced is recappable, and, if the vehicle cannot be operated with either type of tire, the applicant may be granted a certificate for a used truck-type tire.

Amendment 85, effective September 15, states that tire inspection records will not be used in rationing after "A" gasoline ration books expire September 22 except for the East Coast, when the date is February 9, 1945. The next amendment, effective September 16, requires that tire dealers who sell to consumers sell any new tire in their inventory to any person who presents a valid tire rationing certificate and the purchase price of the tire; also dealers must post daily inventories of their stock of tires with a cross-section size of 8.25 or larger.

Amendment 87, effective September 29, rules that tire dealers, except those defined as "mass distributers" by the WPB, must take a quarterly inventory of tires for the OPA. For the purpose of this order a "mass distributer" has been defined by OPA as "any dealer who sells tires and tubes manufactured for him under his own brand or trade mark, and whose sales volume in 1941 exceeded 50,000 tires or 100,000 tubes." Heretofore persons who filed tire inventory reports with the WPB were not required to take a quarterly inventory for OPA. But the information required by WPB did not include a breakdown between tires held for sale at the retail level and those in manufacturers' warehouses. OPA further stated that all dealers now required to take quarterly inventories must report these inventories for the quarter ending September 30. Previously only a small number of the 100,000 dealers in the country have actually had to report their inventories since OPA has merely taken a "sampling" of inventories each quarter. Before September 30 all dealers were mailed the OPA's inventory reporting Form "R-17" which had to be returned within three days after September 30.

At the same time OPA also amended its regulations covering the use of replenishment portions of ration certificates to provide that manufacturers be required to mark all replenishment portions "Void" immediately upon receipt. In case the manufacturer finds that he cannot fill the portion, provision is made for him to return the certificate or receipt to his OPA District Office, which will forward a valid replenishment portion to the dealer.

Amendment 10, RO 1B—Mileage Rationing: Tire Regulations for Puerto Rico—effective September 1, drops all references to inner tubes from the order.

Amendment 1 to Rev. RO 1C—Tire Rationing Regulations for the Virgin Islands—effective September 7, covers granting of certificates to List C applicants; voiding of a certificate after expiration date; and delivery of tires or tubes in accordance with the certificate.

Amendment 11 to RO 1E—Mileage Rationing: Tire Regulations for the Territory of Hawaii—effective October 1, makes several changes in the regulation, covering such points as: inspection of tires and tubes, use of certificate, prohibitions, and removal of tires by automobile dealer. No. 12, effective September 18, withdraws inner tubes from rationing.

Amendment 1 to RO 1E—Tire Rationing Regulations for the Territory of Alaska—effective September 13, among other changes drops inner tubes from rationing control and defines a "new" tire as one used less than 1,000 miles.

Emergency sales of new tires and tubes to any government agency may be made at the maximum delivered prices in Appendix A of MPR 415—Certain Federal Government Purchases of New Tires and Tubes—according to Amendment 8, effective September 18. Emergency sales are defined as consisting of not more than 25 tires and 25

tubes, or amounting to not more than $1,000, whichever is less. The action has been generally approved by representative members of the industry consulted, and interested government agencies, OPA said. Heretofore this regulation had no special provision for emergency sales. Ceilings under the regulation are established in two groups. Appendix A covers sales to any government agency other than the FEA (including Lend-Lease), the War and Navy departments, and the Maritime Commission. These sales are made at what is commonly referred to as the Treasury Procurement level, and ceilings are delivered prices. On sales to the foregoing agencies ceilings are 5% less than those in Appendix A, but are f.o.b. seller's shipping point. Industry has shown that certain sales of an emergency nature are customarily made at the Treasury Procurement level, regardless of the agency to which the sale is made. Amendment 8 enables this practice to be continued.

Order 13 under MPR 528—Tires, Tubes, Recapping and Repairing—effective August 26, establishes maximum retail prices for certain new all-purpose (super-traction) truck, universal (off-the-road) truck, and earth mover super-traction (trailer type) tires of cotton construction made by The B. F. Goodrich Co., Akron, O.

Amendment 13 to RO 6A—Men's Rubber Boots and Rubber Work Shoes—effective September 15, releases men's rubber riding boots certificate-free. The action applies only to a special type of all-rubber riding boot not in common use, and so far as is known, probably less than 1,000 pairs are in dealers' stocks or being held in Customs' warehouses. To be eligible for release, the rubber boots must fall within this classification: below knee-height, with inside pull-on loops, shaped leg and ankle, made over a special riding boot last. Dealers are to apply to the OPA district office for permission to sell boots of this type certificate-free.

Amendment 77 to RO 17—Shoes—effective September 25, makes non-leather shoes with rubber soles ration-free.

Amendment 4 to MPR 406—Synthetic Resins and Plastic Materials and Substitute Rubber—effective September 21, raises prices at all-sales levels for ester gum containing gum resin, to meet increased costs.

Amendment 4 to MPR 478—Coated and Combined Fabrics—effective September 11, authorizes manufacturers who compute proposed ceilings for new coated or combined fabrics not sold during the base period of the regulation to issue invoices and accept payment at the proposed prices, subject to OPA approval. The same holds for services.

Recently announced price control provisions for sales by the federal government of all commodities except food and those commodities originally purchased by the government for resale or stockpiling do not supersede four supplementary orders previously issued that apply to specific types of government sales, according to Amendment 1 to Supplementary Order 94—Sales by Government Agencies and Resales by Certain Buyers—effective September 1. The four supplementary orders, which remain in full force and effect, are: Revised Supplementary Order 10—Judicial Sales; Supplementary Order 27—Sales by Certain Stores Operated or Regulated by the War Department or the Department of the Navy; Supplementary Order 46—Exemption of Auction Sales of Contents of Dead Letters or Packages by Post Office Department; and Supplementary Order 88—Exemption of Seized, Unclaimed Abandoned Commodities Sold at Auction by the Bureau of Customs. OPA also pointed out that the new price control provisions do not apply to the rental of commodities. The definition of "sell" has been amended by omitting the word "lease" to make this clear.

MPR 561, effective September 20, sets ceilings for gum rosin at levels based on the average prices prevailing during June-July, 1944, for sales on the Savannah Naval Stores Exchange.

T. W. Smith, Jr., of Sun Rubber Co., Barberton, O., is on the OPA industry advisory committee on toys, games, and wheel goods.

Vulcanizing Agents for Synthetic Rubbers

Under the trade name Vultacs, the alkyl phenol sulphides are available to the rubber industry in commercial quantities as active primary vulcanizing agents for the butadiene copolymer synthetic rubbers. With GR-S they function not only as vulcanizing agents but also as effective tackifiers. Three modifications of these brown resins, all based on para-tertiary amylphenol and differing in sulphur content, are being manufactured by Sharples Chemicals Inc., 123 S. Broad St., Philadelphia 9, Pa. The limited solubility of sulphur in GR-S and Buna N types of synthetic rubber requires the highest degree of dispersion to obtain the maximum properties inherent in these rubbers. Since the Vultacs are easily soluble in synthetic rubbers and release active sulphur uniformly throughout the rubber during cure, the resulting vulcanizates are said to show, compared to similarly formulated sulphur compounds, improved resistance to flex cracking and tear, lessened "marching modulus" after aging, and retention of tensile strength and elongation after severe aging and at elevated temperatures. Elongation is also maintained on overcures. Vultac #1 is recommended by the manufacturer for shoe stocks that require building tack and an even rate of cure. Vultac #2 and #3 is recommended for total replacement of sulphur, but in different amounts per 100 parts of polymer, and Vultac #3 is claimed to be especially suitable for Buna N type of polymers.

R-1 Revised Again

The following, Direction 1 to R-1, was issued September 4:

"Wherever Rubber Order R-1 as amended August 25, 1944 (including Appendixes), requires communications, reports or applications to the Office of the Rubber Director, War Production Board, they shall be made to the War Production Board and where the order requires any authorization to be obtained from the 'Rubber Director, War Production Board' an authorization from the 'War Production Board' shall be sufficient."

R-1, Appendix IV as Amended September 16, 1944—Tire Allotment Plan—changes all references in the list of Office of the Rubber Director to War Production Board. Also, effective October 1, bogie roller tires are dropped.

The WPB Operating Committee on Aircraft Materials Conservation on September 15 approved Conservation Directive No. 18A—Use of Crude Rubber and Synthetic Rubber Elastic Shock and Exerciser Cord in Aircraft Applications—which replaces Directive No. 18, approved April 22. The three changes made relate to appeals from the restrictions of R-1; desirability of redesign to eliminate the use of elastic cord wherever practicable; and the submitting of contemplated redesigns to proper authorities for approval.

L-143-a as Amended September 5, 1944—Rubber Processing Machinery and Equipment—permits manufacturers to fill, as unrated orders, any orders not authorized on Form WPB-1277 provided they do not interfere with production or shipment of orders specifically rated on WPB-1277. Besides used rubber processing machinery may now be bought and sold without restriction; and applications for authorization are no longer required to purchase repair parts, or to obtain permission to rebuild rubber processing machinery.

WPB recently removed allocation controls from civilian production of styrene and butadiene because they are now in sufficient supply as the result of improved production techniques. The allocation control was lifted by revoking Order M-178 (butadiene) and by an Amendment to Schedule 18 (styrene and dichlorosytrene) of Order M-300. Production of butadiene and styrene in government financed and operated plants has never been subject to allocation.

With current shortages of heavy-duty truck tires as the most serious threat to log and lumber production since the beginning of the year, WPB on September 25 issued a conservation guide for tires for the use of the lumber industry. The industry as a whole hauls about 80% and in some areas 100% of its logs all or part of the way to sawmills by truck. The supply of large-size tires now available to the lumber industry is materially below minimum requirements, WPB said. Shortages in these tires are expected to continue into the fourth quarter of 1944. WPB urged that the lumber industry conserve its tires by improving roads, reducing truck hauls, recapping tires, and checking condition of trucks and their operation.

Synthetic organic detergents have been added to General Allocation Order M-300, under Schedule 44, effective October 1.

Treasury Department, Procurement Division, Washington 25, D. C., on September 2 announced a unique plan of redistribution of surplus tires now being used by the Office of Surplus Property. The plan provides for national distribution and has just been tested in the disposal of 70,000 tires declared surplus by the Army. A group of 25,000 new and 31,000 used small truck tires were sold back to 23 of the 26 tire manufacturers in the United States, each receiving an allotment based on their usual replacement business. These manufacturers will in turn pass them on to regular distributors, thus assuring a wide distribution. This plan will be followed by the Automotive Division of the Office of Surplus Property as other tires become available as surplus. Another group of 14,000 tires were sold to other government agencies, including the Navy, Department of Interior, Department of Agriculture, and Lend-Lease. All tires are being sold under existing regulations of ODT, OPA, and ORD. It was also stated that there were no immediate prospects of surplus tires in larger sizes as there is still critical military need of them.

Office of Defense Transportation, Washington, D. C., last month reported annual savings of more than 47,152,000 truck miles in transportation of livestock to market and more than 397,400,000 tire miles in transporting dairy products by commercial motor vehicles from producers to assembly points and processing plants, under conservation programs established by ODT.

EASTERN AND SOUTHERN

Sharples Chemicals Promotions

Sharples Chemicals, Inc., Philadelphia, Pa., has appointed as director of development Howard I. Cramer, in charge of the Sharples development of rubber chemicals since 1941. Dr. Cramer was graduated from the University of Akron and received a Ph. D. from the University of Wisconsin in 1929. From 1929 to 1933 he was a member of the research division of the Goodyear Tire & Rubber Co. Next he was at the University of Akron as assistant professor in charge of rubber chemistry until he joined the Sharples staff in 1941.

George E. Hinds, formerly assistant to the vice president in charge of research and development, has been made director of technical coordination. Dr. Hinds was graduated from the William Jewell College in 1929 and Purdue University, where he completed his doctorate in 1936. Then he joined the Sharples research organization in Wyandotte, Mich., and was transferred to the Philadelphia office in 1939.

Perrin G. Smith has been promoted to assistant to the director of development, from the Sharples research department in Wyandotte, where he was a group leader in charge of catalyst research. Dr. Smith was graduated from Austin College in 1934 and received his doctor's degree in 1938 at Northwestern University. After two more years at Northwestern as research associate he joined Sharples at Wyandotte.

Socony-Vacuum Oil Co., Inc., 26 Broadway, New York 4, N. Y., on September 14 elected B. Brewster Jennings president and chairman of the executive committee and Harold F. Sheets chairman of the board. Mr. Jennings succeeds John A. Brown, who died September 9; while Mr. Sheets fills a nine-year vacancy.

Carrier Corp., Syracuse, N. Y., has announced that Frederick W. Smith, for 19 months chief of the Special Equipment Branch of the General Industrial Equipment Division, WPB, will become associated with Carrier on November 1. Prior to his association with the WPB in April, 1942, Mr. Smith for 16 years was with the Frigidaire Division of General Motors Corp. in a variety of capacities.

Hercules Powder Co., Wilmington, Del., has opened a new sales office in the Union Commerce Bldg., Cleveland, O., to handle synthetics department sales in Michigan, Ohio, western New York, western Pennsylvania, and Ontario, Canada. W. Wallace Trowell, of the Wilmington office, is manager of the new branch office, and John L. Present, also of Wilmington, will serve as technical representative and assist with sales operations.

Hercules has announced also expansion plans for its ethyl cellulose plant at Hopewell, Va., to meet greater Army and Navy demands by increasing capacity more than 60%.

Heyden Chemical Corp., 393 Seventh Ave., New York, N. Y., recently announced that James M. Crowe, former managing editor of *Chemical Industries,* has been appointed to handle the company's advertising and market development work.

Leonard H. Cohan

Continental Carbon Co., 295 Madison Ave., New York 17, N. Y., has appointed Leonard H. Cohan director of research in charge of its Chicago, Ill., and Sunray, Tex., activities. Dr. Cohan has served as chief chemist for the Continental organization since 1942, prior to which he was a research chemist in the company. Before joining Continental, Dr. Cohan had been on the faculty at Johns Hopkins University. He belongs to the American Chemical Society, American Gas Association, and American Association for the Advancement of Science.

This appointment is made in conjunction with the company's expanded research and product development activities, which include increased and improved laboratory and pilot-plant installations at Sunray and more extensive work at the Chicago research laboratory on product development. In addition, to supplement its own research staff and facilities, a program of investigation of a fundamental nature on carbon black is being sponsored at the Institute of Gas Technology, Division of Illinois Institute of Technology, Chicago. This work is directed toward conservation of the country's irreplaceable resources of natural gas and toward development of new products for the synthetic rubber and other industries.

Witco Chemical Co., 295 Madison Ave., New York, N. Y., recently announced that the WPB had granted projects to its affiliates, Continental Carbon Co. and Panhandle Carbon Co., for the construction of new channel carbon black plants, each with the capacity to burn 30,000,000 cubic feet of gas daily. Engineering and purchasing of the materials for these two plants is under way. R. I. Wishnick, Witco's president, also said that extensive plant expansions had been made at the Continental and the Crown Carbon Co. plants.

Victor E. Wellman, formerly director of purchases of the chemical division of The B. F. Goodrich Co., has become a technical sales executive for R. W. Greeff & Co., Inc., chemicals exported, importer, and selling agent, 10 Rockefeller Plaza, New York, N. Y.

Tire Cord Films Released

Three short motion pictures stressing the vital part played by workers in the manufacture of tire yarn and cord were released in September by the Tire Yarn & Cord Manufacturer's Publicity Committee headed by T. H. Young, advertising manager of the United States Rubber Co. Working with him was Edward Harrington, advertising manager of the rayon division of E. I. du Pont de Nemours & Co., Inc., and G. P. Barnwell, of Bibb Mfg. Co. The films, approved by the WPB, were created to combat absenteeism in the industry. They are augmented by actual shots from Army and Navy films. The three short shorts, "Mary Had a Sweetheart", "Out of Action", and "Battle Yarn" will be shown in theaters in communities where tire yarn and cord are made.

The Neville Co., Pittsburgh 25, Pa., formulated postwar marketing plans at a recent one-day meeting of sales agents at the Neville plant, Neville Island. Representatives of 11 of the 15 Neville agencies covering the United States and Canada attended. Subjects discussed included: "New Uses for Neville Products", Sales Manager L. V. Dauler; "New Products of the Past Year, New Products Now in Pilot Plant Development, and Possible New Developments", L. M. Geiger, director of research; "Expanded Technical Service for Customers", D. L. Marsh, technical service laboratories; and "Future Technical Possibilities", J. H. Lux, assistant director of research. A general discussion of these subjects and the formulating of future sales practices and methods followed. H. N. Dauler, president, presided. The agents were also given a technical review of the origin of raw materials of Neville products and the company's production processes by J. G. Hatman, chief engineer and executive consultant. An inspection of the plant followed. The meeting concluded with a banquet.

Agents attending were: T. W. Ashley, T. C. Ashley & Co., Boston, Mass.; D. D. Bradley, Commercial Chemicals, Inc., Buffalo, N. Y.; J. H. and P. E. Calo, John H. Calo Co., New York, N. Y.; O. E. Goetz, Krekel-Goetz Sales & Supply, Grand Rapids, Mich.; C. L. Hueston, C. L. Hueston, Detroit, Mich.; E. P. Lambert, Chas. T. Wilson Co., New York; V. L. Roberson, C. I. Irons Co., St. Louis, Mo.; George Senn, Philadelphia, Pa.; C. L. Small, Smead & Small, Inc., Cleveland, O.; E. F. Wilson, E. H. Haines Dist. Co., Chicago, Ill.

The Sixteenth National Exposition of Power & Mechanical Engineering at Madison Square Garden, New York, N. Y., November 27 to December 2, will, as heretofore, feature apparatus for the production, control, distribution, and transmission of heat and power. Power-plant equipment exhibited will include the many lines of materials, supplies, equipment, and instruments which afford the means for converting existing power plants to serve new and larger demands with better economy. Machine tools, instruments, and tool-room equipment will constitute another group of exhibits. There will also be displays of metals and other materials adapted to power-plant and mill construction, alteration, and maintenance; materials handling equipment; engineering specialties; and laboratory equipment for research and for production control. Admission is by invitation and registration only; there is no admission to the general public.

U. S. Detroit Plant Enlarged

To provide large-size tires of a special type needed in invasion operations, United States Rubber Co., 1230 Sixth Ave., New York 20, N. Y., will begin constructing at once a new addition to its Detroit, Mich., plant. A force of 450 additional people will be needed to operate the new project when completed. Cost of this project is estimated at $5,542,990 and will be shared by the Defense Plant Corp. and the rubber company.

Made of synthetic rubber and known as flotation tires because of their shallow tread which enables them to grip soft and insecure surfaces, the tires to be made here will add considerably to the mobility of mechanized equipment. They will be used on trucks, amphibious equipment, and other vehicles, and because of their unusual size will replace dual tires formerly in use on various types of mechanized units. Carrying a lower air pressure than conventional tires, the flotation tire enables combat vehicles to traverse swampland, deserts, or sandy beaches without hindrance.

As an important set toward peacetime operations at the company's Alice Mill at Woonsocket, about 7,000 square feet of floor space were gained by restoring one floor in the plant's enormous barrage balloon inflation room. Restoration of a second floor is planned for the immediate future.

A new branch plant of U. S. Rubber, operating under the Woonsocket, R. I., management, is being established at Keene, N. H., according to W. E. Bittle, Woonsocket plant factory manager. The new development contains two units totaling 19,000 square feet and will employ about 100 to 150 workers on a high priority item for the government. Made necessary owing to lack of help in the Woonsocket area, the move was decided upon as an aid to the Woonsocket plant, which recently received a large contract for barrage balloons. The Keene activity will tie in closely with this program, it is stated. Another factor in the move concerns the company's desire to continue its conversion to peacetime manufacture at Woonsocket which was begun early in the summer.

The Mishawaka, Ind., plant is producing a plastic made of fiberglas, laminated and reenforced with a thermosetting resin, from which cabin structures for the war helicopter, R-6, are constructed. The material, developed by the rubber company, was chosen for this use because of its light weight, great tensile strength, rigidity, and ability to withstand strains and excessive vibration. It is not affected by gasoline, oils, acids, most alkalis, alcohol, or fungus growth, and is said to retain all of its properties in sub-zero temperatures as well as tropical heat. The plastic is also used to support bullet-sealing fuel cells.

Edgar S. Ross, who has completed his assignment as chief of the Lubricants Section, Aviation Division, Petroleum Administration for War, Washington, D. C., after serving for 15 months, had been assistant manager, charge of specialties, development division, Sun Oil Co., Marcus Hook, Pa. Dr. Ross now, however, has returned to the Sun company, with offices at Philadelphia, Pa., where he will devote his time to the development of technical sales with the industrial products department.

Pittsburgh Plate Glass Co., 632 Duquesne Way, Pittsburgh, Pa., has appointed as assistant comptrollers R. W. Mothershed, chief warehouse auditor, and A. W. Smiley, general auditor.

Seeks Lighter Coated Fabrics

A project to reduce the weight of coated fabrics which a soldier must carry has been undertaken by the Office of the Quartermaster General, United States Army, in cooperation with Brooklyn Polytechnic Institute, Brooklyn, N. Y., under the direction of Herman Mark, professor at the Institute. Besides reducing the weight of raincoats, ponchos, tents, hammocks, clothing, and other equipment, the research project will seek to improve aging characteristics, abrasion resistance, adhesion, low temperature flexibility, and other unperfected factors. Because of the shortage of phthalate plasticizers, new plasticizers for plastics used in fabric coatings will be sought. Industrial organizations in the plastics and textile industries will cooperate in the research and developments of samples. The National Bureau of Standards and the R. H. Macy Laboratory will aid in testing fabrics developed.

Du Pont Advances Several

E. I. du Pont de Nemours Co., Inc., Wilmington, Del., has appointed John F. Daley general manager of the pigments department to succeed the late Carl H. Rupprecht. Mr. Daley, who joined the company in 1915 as a timekeeper at the smokeless powder plant, has served as chief supervisor there, as a sales representative, supervisor on the production of alum, paints, varnishes, and then dry colors production manager, works manager of an Ordnance plant, deputy field director of ammunition plants, director of sales of the pigments department, and, recently, as acting assistant general manager of the department.

The retirement of William Richter as general manager of the fabrics and finishes department and the appointment of J. Warren Kinsman as his successor, effective October 1, were also announced by du Pont. William Kirk, manager of the Chambers Works at Deepwater Point, N. J., will succeed Mr. Kinsman as assistant general manager of the company's organic chemicals department.

Mr. Richter's retirement from active duty with the company, occasioned by reasons of health, will become effective November 1. He has completed nearly 40 years service with du Pont and has headed the fabrics and finishes department since 1927. He will retain his membership on the board of directors, to which he was elected in 1930.

Robert J. Goodrich has been promoted from assistant manager to manager of the Chambers Works, succeeding Dr. Kirk. Mr. Goodrich has been associated with the chemical industry 28 years.

Robert Emmett Burk, former professor of chemistry in the graduate school of Western Reserve University, has joined the du Pont plastics department as special assistant to John L. Brill, the department's chemical director. Dr. Burk, author and editor of books and treatises on polymerization, was, until now, director of research for the Standard Oil Co. of Ohio. He is chairman of the committee on catalysis of the National Research Council and vice chairman of the petroleum section of the American Chemical Society.

Manhattan Rubber Mfg. Division, Raybestos-Manhattan, Inc., Passaic, N. J., has appointed Littleton C. Barkley, manager of the New York office, sales manager of its mechanicals sales department, with headquarters at 120 Broadway, New York, N. Y.

OHIO

The General Tire & Rubber Co., Akron, last month announced that Elmer E. Nelson has joined its Washington office as promotional engineer. At the outbreak of the war, Mr. Nelson was a territory salesman for General, having worked in the Kansas City and Los Angeles branches, but left to become an instructor at the Army Flying School at Visalia, Calif. He later was a test pilot on the Navy program at the Douglas El Segundo plant. His work with General will be the promotion for peacetime use of rockets now used by the Navy to increase takeoff distance by 30 to 60%. Manufactured in Pasadena by General Tire, the rockets were perfected by a group of California scientists operating as the Aerojet Engineering Corp. The entire production is being turned over to military use, but a great postwar use of them is forecast by Mr. Nelson.

Howard Bellows has been appointed eastern division manager of General Tire. Mr. Bellows, who has been with General in a sales capacity since 1924, will make his headquarters in New York, although his responsibilities include supervision of the Philadelphia branch as well. A native of Richmond Va., Mr. Bellows was territory salesman in Virginia and North Carolina, later eastern division manager, then central division manager, southeastern division manager, and now division manager of an enlarged eastern territory.

The Timken Roller Bearing Co., Canton 6, has appointed Howard C. Sauer general manager of its newly created foreign division, which will handle the sales and service of the company's products, bearings, steel, and detachable rock bits, in the world market outside the U. S. A. The division's offices will be in Canton. Mr. Sauer was chief of the anti-friction bearing section of the tools division of the WPB from September, 1941, to September 1, 1944. He had joined Timken in 1923 and was employed as a salesman in the Cleveland office. In 1926 he became branch manager of the Detroit office, in 1930 was promoted to the Chicago office, and in 1940 was made branch manager of the New York office.

Industrial Rayon Corp., Cleveland, recently announced a method of twist-setting tire cord used in its mills to solve one of the problems in the current 240-million-pound a year tire cord program. Large 18-pound cones and 4½-pound spools of rayon tire cord are passed between high-frequency electrodes on an endless belt conveyer powered by a Thermax unit. The equipment greatly simplifies twist-setting, which has usually been done by slowly heating one-pound spools in large chambers.

Emery Industries, Inc., manufacturer of animal and vegetable fatty acids and all Twitchell products, 4300 Carew Tower, Cincinnati 2, O., has opened a branch sales office and warehouse at 401 N. Broad St., Philadelphia 8, Pa. M. Jay Veenstra has been appointed district chemical sales manager.

Defense Plant Corp., Washington, D. C., in a recent announcement of contract authorizations revealed an increase in a contract with Sun Rubber Co., Barberton, O., at a cost of about $65,000, bringing the total commitment to about $240,000.

Continuous GR-S Polymerization Process Developed

The Goodyear Tire & Rubber Co., Akron, recently announced a continuous polymerization process developed by company chemists and engineers which will increase by 40% the capacity of the nation's synthetic rubber plants. Thus the total production potential of existing plants is now 1,338,000 long tons annually. The improvement costs about 1% of the original capital cost of a plant.

The process, said to result in a more uniform synthetic rubber with better working qualities, has been used for several months in a government-owned plant operated by Goodyear at Houston, Tex. Plans are being perfected to use the process in Goodyear-operated synthetic rubber plants at Akron and Los Angeles, Calif.

In this process reactors are connected together by pipe lines in groups to form a chain. Carefully timed pumps admit the ingredients in a continuous stream into the first reactor in the right proportions and at the correct rate. The reaction takes place as the mixture moves through the chain of reactors, and GR-S latex emerges from the last reactor in a continuous flow. Controls maintain the current temperature in each reactor. Temperature changes at various stages of the process are handled without loss of time as the liquid moves from one unit to another. All reactors are 100% full at all times, and no time is lost in filling or emptying the reactors or in waiting for polymerization to get under way. Fewer pipes, pipelines, and valves are needed than when each reactor is operated as a unit.

R. P. Dinsmore, vice president in charge of research and development at Goodyear, said in summing up the advantages of the new process, "Continuous polymerization allows a more efficient and simple plant operation, an important step in the direction of a cheaper GR-S rubber. The rate of production is increased and can be accomplished with an actual decrease in manpower requirements, an important factor in wartime labor shortages. The continuous operation is so designed that more efficient, automatic control of the process can be obtained than was possible with the former batch-type operation. This results in a more uniform rubber with superior qualities that simplify the milling of the resultant rubber, and, therefore, should speed up tire production from it."

Other Goodyear Developments

Building permit has been issued for construction of a new warehouse at 6701 S. Central Ave., Los Angeles, Calif., for Goodyear Tire to cost $16,000.

R. T. Brown, manager of the military products engineering course, announced that on September 11, 75 Air Force officers began a 10-day rubber conservation course in Goodyear Hall. After completion of the course they will become staff officers in various theatres of war to direct all repair work involving rubber products as well as be in charge of rubber conservation efforts. Among the subjects studied were life-rafts, life-vests, bullet-sealing and hydraulic hose, bullet-seal fuel cells, airplane wheels, tires, and brakes, deicers, tires and tubes, and allied products. Instructors and lecturers for the course were supplied by Goodyear and other major rubber companies.

Recently introduced was the new "Hi-Miler S Rib" tread design for synthetic rubber truck tires which is reported to retard growth of tread cracks and reduce running temperatures of the tires by as much as 50 degrees. Goodyear engineers said retarding of crack growth is accomplished by altering the conventional continuous tread ribs to include terminals at about every half inch in the crevice between the ribs. Reduction of heat is gained by using a completely ventilated shoulder on the tire instead of the unbroken rib-type shoulder. Production in the entire range of sizes for all over-the-road uses is under way.

W. C. Winings, manager of Goodyear's mechanical goods division, and Paul D. Suloff, of the mechanical goods development department, recently announced the construction of a rubber belt for use with a machine in testing airplane tires and brakes which can be loaded to about seven times the tension of the heaviest belt previously made. The belt, which has a steel-cable carcass, weighs 2,730 pounds. The 600 parallel steel cables extending over the belt's 60 inches of width for its entire length account for 1,280 pounds of the total weight; the rubber alone weighs 700 pounds, and there are 750 pounds of cotton in six plies of fabric which house the steel cables between exterior sheaths of synthetic rubber. When looped, the belt can withstand a pull of more than half a million pounds.

Firestone Developments

Firestone Tire & Rubber Co., Akron, has in volume production Foamex, a foam rubber produced from synthetic latex. This soft and fluffy material, which can be made in medium and firm densities, is produced by whipping synthetic latex into a creamy froth. In the process innumerable interconnected tiny air bubbles are trapped to give the foam rubber its softness and permit free circulation of cooling air. Low in cost, Foamex is said to be extremely light, washable, odorless, and unattractive to moths and vermin. The tensile strength is claimed to be equal to or greater than foam rubber made with natural latex. It can be made to remain flexible at sub-zero temperatures. When soaked in gasoline, Foamex increases slightly in volume, but returns to normal when dry. Oil does not greatly affect it. Tank buffers and various cushioning applications for military use are current products made from Foamex. After the war it will be used for mattresses, furniture upholstery, automobile and truck seat cushions, and similar products.

Construction of 1½ million new rubber-tired tractors in the first five postwar years and a 100% increase in their number within a decade were forecast last month by John W. Thomas, chairman and chief executive of the Firestone company. Figures compiled by the company's business research division, he said, show that the spectacular prewar growth in farm mechanization will continue at a more rapid pace than ever when peace returns. At the start of 1944, 1,450,000 rubber-tired tractors were on American farms. Many of these, now obsolete, are waiting to be scrapped, Mr. Thomas pointed out, and their replacement will constitute a large proportion of the 1½ million tractors to be built in the first five years after the war. There will be more than three million rubber-tired tractors on farms, he predicted, within 10 years after the war; and the increased use of rubber tires on other farm vehicles will equal the upsurge in the tractor field.

Creation of a new division to provide a job for every qualified Firestone veteran returning from the Armed Forces was announced recently by the Firestone company. This division will recognize special training, special aptitudes, and leadership qualities developed in the service and will see that veterans are placed in jobs that will take full advantage of such service-acquired abilities. The Firestone veterans reemployment division already is handling cases of former employes released from the service. Members of the reemployment division interview each veteran and study his record and experience since he entered the Armed Forces, with a view to returning him to his former job or to another job for which he has become better suited. John W. Thomas, chairman and chief executive, has sent a letter to former Firestone employes in the service, notifying them of tne establishment of this division.

Firestone has announced a program for merchandising aircraft products to private fliers. Inaugurated by L. R. Jackson, executive vice president, franchises have been granted to aircraft dealers at two key airports. Designed to meet needs created by the rapid expansion of private flying, the program will offer services and products to dealers and pilots. In addition to tires, tubes, wheels, brakes, storage batteries, spark plugs, and brake linings, flying accessories and apparel will be offered. Other items such as cameras, radio sets, and binoculars will be added as soon as manufacturing restrictions are lifted.

Goodrich Announcements

The B. F. Goodrich Co., Akron, has completed alterations of processing equipment at its vinyl resin plant at Niagara Falls, N. Y., where the production of both vinyl polymers and copolymers was scheduled for September. The Niagara Falls plant was originally designed to turn out vinyl polymers, but when the Goodrich chemical division developed a new series of vinyl-vinylidene chloride copolymers, plans were made to change the processing equipment so that either polymers or copolymers could be created. Practically the entire output will go into direct military service.

Work is also being carried through on the expansion of the chemical plant in Louisville, Ky., which also produces vinyl resins.

A veteran of World War I, Ernest P. Weckesser has been appointed administrator to correlate all activities connected with the employment of returning veterans by the Goodrich company. The company's policy regarding veterans, in addition to complying with Section 8 of the Selective Service Act of 1940, will follow a broader policy regarding various phases of the task. Most important provisions will be the restoration of seniority to former employes if they are reemployed within one year after their honorable discharge from service, and putting into force such insurance and other benefits as their seniority commands. Every reasonable effort will be made to reemploy the returning veteran in the same position he had before going into service, or one with the same seniority, status, and pay. Special training, which will include the opportunity to utilize as rapidly as possible any new skills developed by the veteran while in uniform is part of the program. Employment of veterans not previously connected with the company also will be part of Mr. Weckesser's responsibilities.

Elmer T. Campbell has been named manager of Goodrich's government sales office in Washington, D. C. He has been in various sales posts with the company since 1921; his most recent, assistant manager of the petroleum sales department for several years.

Arthur W. Sloan, rubber chemicals research head of the Goodrich company, left for Cairo, Egypt, last month to take up

his duties as chief of chemical allocations in the Middle East for the Foreign Economic Administration. He expects to return to the company at an early future date.

David M. Goodrich, chairman of the board, recently received his 30-year service pin.

Pharis Tire & Rubber Co., Newark, O., recently announced an extensive expansion program involving the expenditure of more than a half million dollars, after it had sold, privately, to the Mutual Life Insurance Co. of New York a 4% loan totaling $1,000,000. Approximately $450,000 of the proceeds will be used to repay bank borrowings incurred in the acquisition of Molded Materials, Inc., Ridgway, Pa., and Carlisle Tire & Rubber Co., Carlisle, Pa. Molded Materials was acquired several months ago as part of an enlarged production program for making brake lining. The Carlisle company will increase tube production of the Pharis organization. Plans are now in the making for additional plant and warehouse facilities as part of the company's postwar program, according to President Furber Marshall.

W. E. Eberts, for the past four years sales promotion and advertising manager at Pharis, has been commissioned a lieutenant (j.g.) in the United States Navy. Besides his promotional and advertising duties, Mr. Eberts was in charge of all company sales division managers and served as editor of the company's house publication, "Pep", and a trade magazine, "Profit Pointers." During his leave of absence, his duties will be assumed by Hynes Pitner, vice president in charge of sales.

Mansfield Tire & Rubber Co., Mansfield, is erecting a four-story addition that will provide about 15,000 feet of floor space for the handling of more raw materials under a stepped-up production schedule, G. W. Stephens, president of the company said. The cost of the brick-faced, reenforced concrete building will be about $70,000. This structure is the second building addition to the Mansfield factory undertaken this year as part of a planned expansion program to increase plant production capacity.

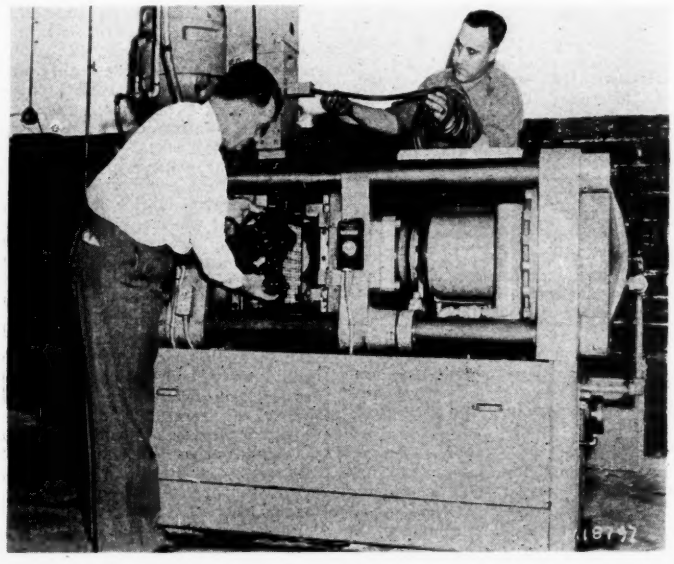
MIDWEST

Brown Rubber Co., Inc., Lafayette, Ind., has appointed Calvin S. Yoran research and technical director, responsible for postwar product developments. Dr. Yoran formerly had been with Witco Chemical Co. and before that with Featheredge Rubber Co., both in Chicago, Ill.

Continuous Injection Molding Machine

Chrysler Corp., Detroit, Mich., recently announced the development of a continuous injection molding and extruding machine which employs a worm screw similar to those found in coal furnace stokers. An experimental machine has produced hundreds of rubber and plastic parts and articles and another is ready to mass-produce rubber insulators. The new development is expected to increase about tenfold the making of any thermoplastic and thermosetting plastics and natural and synthetic rubber articles. As many as 144 rubber insulators have been produced by the machine at one molding in less than three minutes.

The continuous injector consists of a simple hopper from which the materials are fed to a heating cylinder where a special churning apparatus keeps them evenly mixed. The putty-like substances are then shot under screw pressures up to 22,000 pounds per square inch through a nozzle clamped to an opening where the die plates join. When every tiny crevice in the mold, or series of molds, has been filled, the back-pressure automatically shuts off the feeder. The uniform feed and even mixture of materials have reduced curing time about 93%, compared with other types of machines. Waste is completely eliminated. Different dies for different sizes of products can be used with the same continuous injection head. Eventually the new machine, developed from an original apparatus conceived and built by W. P. Cousino, a project engineer at Chrysler, may displace the compression method of molding plastics and rubber, company engineers believe.



Synthetic Rubber Link Bushings Produced by Continuous Injection Molding Method

Fred J. Wehmer

Products Manager

Fred J. Wehmer is present chairman and a charter member of the Detroit Rubber & Plastics Group, which is sponsoring the course in the chemistry of rubber and plastics at Wayne University. Products manager of the adhesive division of the Minnesota Mining & Mfg. Co., at Detroit, Mich., he has continued to take a very active part in the affairs of the rubber group and of the Detroit Section of the American Chemical Society, having served on the Group's executive, program, and Christmas party committees.

Born February 6, 1903, in Sterling, Neb., he was 18 when he left the farm he was raised on and started his career in chemistry—as student in the University of Nebraska, winning the B.S. degree in chemical engineering in January, 1926. In April, 1927, he went to work for The B. F. Goodrich Co., Akron, O., as compounder; then in February, 1932, he left that company to become development engineer for the Liquid Carbonic Corp. In August, 1936, Mr. Wehmer became adhesive compounder and chief chemist of the adhesive division for Minnesota Mining.

His fraternities are Alpha Chi Sigma and Sigma Tau, and other societies to which he belongs are the A. C. S. and American Institute of Chemical Engineers. Away from all these business and fraternal activities he enjoys golfing, bowling, bridge, and such diversions.

But his "chief hobby" is his home. He lives with his wife and two boys, aged 10 and 12, at 1018 Kennesaw, in Birmingham, Mich.

Reichhold Chemicals, Inc., manufacturer of synthetic resins, chemical colors, and industrial chemicals, Detroit, Mich., last month announced the following promotions: Arthur C. Lansing, manager of research and assistant to John J. Bradley, Jr., director in charge of research; P. Stanley Hewett, director of research, chemicals division; C. John Meeske, director of research, coating resins division; Clinton A. Braidwood, assistant director of research, coating resins division.

The Chicago Drug & Chemical Association's first fall luncheon meeting was held at The Drake Hotel, September 28, when Donald McGibney discussed "What's Ahead in World Affairs."

Gates Rubber Co. will build a four-story and basement reenforced concrete, fireproof manufacturing plant, to cover an area of 175 by 185 feet, on S. Broadway, Denver, Colo.

The Williams-Bowman Rubber Co., Cicero, Ill., which was established as a jobber in 1903, but began making mechanical rubber goods 36 years ago, last month announced several important changes in executive personnel. W. J. Williams, after 41 years of continuous service, has been elected chairman of the board; while Vice President J. C. Bowman, with the company 16 years, becomes president. Named first vice president was General Manager H. R. Brekke, who has been associated with the firm 40 years. Frank Smith, after 15 years of service, has been advanced to the position of assistant superintendent. J. E. Martin, who has served as superintendent for 14 years, will continue in the same capacity.

Van Cleef Bros., manufacturer of rubber products, 7800 Woodlawn Ave., Chicago, Ill., has appointed Bernard T. Ducey sales manager, succeeding H. D. Wexelberg. Mr. Ducey has been associated with Van Cleef Bros. as assistant sales manager since September, 1943, and prior to that time spent ten years in selling and merchandising positions with manufacturers and distributers in the automotive and other industries. H. C. Lewis will serve under Mr. Ducey as advertising manager and assistant sales manager. Mr. Lewis recently resigned from the WPB to accept this position, and his previous experience includes many years in the advertising and sales promotion of automotive products. Van Cleef Bros. has also advanced C. J. Leinen to the post of sales service director, heading a new division of the sales department. This office was created to coordinate all details of correspondence and other service to customers and field representatives.

Thompson, Weinman & Co., Inc., 52 Vanderbilt Ave., New York 17, N. Y., has appointed Robert S. Radcliffe sales promotion manager for the company's products in the Midwest, with headquarters in Cleveland, O. Mr. Radcliffe, a graduate of Lafayette College, has just completed 17 years' experience in the pigment field of the paint industry, having been on the technical staff of the pigments department of E. I. du Pont de Nemours Co., Inc., and more recently the Cleveland representative of R. T. Vanderbilt Co.

Plastic Adhesive

PLIASTIC CEMENT, a synthetic resin adhesive, has recently been placed on the market as a replacement for rubber latex cements in many industrial operations. It is compounded of resin bases with complex non-resinous materials and yields a tough, pliable, continuous film, according to the manufacturer. The soft white fluid cement, which may be used in its natural state or reduced with water, may be applied by brush, gumming machine, spreader, dipping, or spray gun. When dry, it is a semi-transparent, glossy, flexible coating said to have excellent heat sealing properties. It can be applied to one or both surfaces when used in the liquid state for bonding materials; the speed of setting depends upon the porosity of the materials used. Pliastic, made by Paisley Products Inc., is available for many civilian uses in addition to war contract operations.

NEW ENGLAND

Farrel-Birmingham Co., Inc., Ansonia, Conn., has appointed R. C. Wilson sales manager of its Buffalo division, in charge of sales of gears, gear units, flexible couplings, and related products. Mr. Wilson was born in Elmira, N. Y. Following his graduation from the University of Rochester in 1925 with a B. S. degree in mechanical engineering, he was employed by the Gleason Works, Rochester, for seven years. Then he went to Farrel-Birmingham as sales engineer and remained as such until 1942, when he became assistant to the sales manager.

Jesse Jones, Secretary of Commerce, on September 16 announced that Defense Plant Corp., RFC subsidiary, has authorized an increase in its contract with Plymouth Rubber Co., Inc., Canton, Mass., to provide additional facilities at a plant in Canton at a cost of approximately $150,000, resulting in an over-all commitment of about $500,000. Plymouth Rubber will operate these facilities, but title remains in DPC.

Collyer Insulated Wire Co., Pawtucket, R. I., has purchased, at a reported cost of $70,000, a one-story, 265-by-100-foot building on Campbell St., which, after alterations, will be used by the Collyer company for storage and manufacturing purposes.

Jenkins Bros., 510 Main St., Bridgeport, Conn., has announced that James L. Dunn, assistant plant manager of the Bridgeport plant, was elected by the board, September 14, vice president in charge of industrial relations. His duties will be to participate in all collective bargaining activities; to act as liaison between management and labor; to formulate policies in collaboration with the company's industrial relations committee, and see that such policies as are adopted are carried through; and to act as chairman and guide the activities of the labor-management committee. Mr. Dunn started in 1913 as a clerk in Jenkins Bros., and soon rose to the position of production manager, then business manager, and next assistant plant manager, which post he held until his recent promotion.

Middletown Rubber Corp., manufacturer of "Mirrakaf" plumper stock, sock and shoe linings, coated shoe fabrics, combining, and resin coatings, Middletown, Conn., last month announced that Howard H. Berger has joined its staff as chemist. He was formerly with Plymouth Rubber Co., Canton, Mass.

American Wringer Co., Inc., Woonsocket, R. I., has made Earle S. Parks factory manager, succeeding Harry A. Schlosser, resigned. Mr. Parks' former position of superintendent is now being filled by Robert C. Ferris, formerly assistant superintendent. Mr. Schlosser, who had been with the firm for a period of 23 years, also had served as its secretary and vice president.

Defense Plant Corp. last month announced that a contract had been made with the Atlantic Tubing & Rubber Co., Cranston, R. I., to provide equipment at a plant in Bellefont at a cost of approximately $430,000.

PACIFIC COAST

Western Insulated Wire, Inc., Chamber of Commerce Bldg., Los Angeles 15, Calif., last month announced that Edgar H. Hammond, Jr., has joined its organization as manager of sales and field engineering. Mr. Hammond has been in the electrical cable and wire field since 1923, when he became an employe of the American Electrical Works, Phillipsdale, R. I., now known as the Kennecott Wire & Cable Co. Promotions followed, and he was district sales manager at the outbreak of the present war, when his firm loaned him to the government to act as assistant director of the Copper Division, WPB, Washington, D. C. Mr. Hammond resigned that post in August to go to Western Insulated Wire.

Sierra Rubber Co. is the firm name under which Claus H. and William F. Vonder Reith, Earl C. Weiss, and Andrew L. Matelik are conducting business at 2472 E. Eighth St., Los Angeles, Calif.

W. J. Voit Rubber Co. plans an addition to its factory at 1608 E. 25th St., Los Angeles, Calif., to cover an area of 17 by 18 feet and cost approximately $1,000.

Goodyear Synthetic Rubber Corp. is erecting a new welding shop at 12901 S. Vermont Ave., San Pedro, Calif., to cover 40 by 40 feet and to cost $6,000.

Rubber-Coated Glass Fabrics

COMMERCIALLY available Fiberglas fabrics coated on one or both sides with synthetic rubbers or resins are claimed to be resistant to heat, oils, and acids. Application of a properly selected coating to the glass fabric results in a material with high dimensional stability and tear strength. Experience with some of the coated fabrics indicate, it is said, that they may be used satisfactorily under flexing conditions that would destroy an uncoated fabric by internal abrasion. Neoprene, Koroseal, and vinyl resins have been employed as coating material. Present uses of these all-glass coated fabrics include aircraft battery covers, zippered boots for tanks, oil-pressure switch diaphragms, aircraft tape for expansion joints of hot air ducts, and protective aprons for chemical plant workers.

Owens-Corning Fiberglas Corp., manufacturer of glass fabrics, has also developed experimental weaves using Fiberglas yarns for the warp and cotton yarns for the fill. The combination provides high strength in one direction with the glass taking the load and the cotton holding the glass yarns in position. By using such a fabric as reenforcement, plastic laminates equally strong in both directions can be made by placing each layer of cloth crosswise to the preceding layer. A similar application may find value in coated fabrics where maximum tensile strength is sought. Combination glass and asbestos cloths are also commercially available in limited quantities and may prove suitable as a base for coated fabrics. These fabrics combine the bulk, felting properties, and flex resistance of asbestos yarns with the strength of glass yarns.

CANADA

A Department of Munitions & Supply official, Ottawa, Ont., recently announced that synthetic rubber production in Canada has reached the point where it is actually possible to export some rubber and some by-products, but the tire industry still is beset with shortages of manpower, cotton and nylon cord, and manufacturing capacity in its plants. Canadian production of synthetic rubber tires for civilian passenger-car use is climbing to within 70% of prewar usage. Production in 1944 is expected to be about 50% greater than the nearly 600,000 tires produced last year. With few exceptions Canadian tire output has been absorbed by the small group of essential users originally allowed to purchase new tires after the post-Pearl Harbor ban was lifted. Some new groups, such as taxi drivers, who were unable to get new synthetic tires at one time, now can purchase freely under the government's permit system. For the most part, however, the demands of the original group have swallowed up all the new available product. As far as truck tires are concerned, Canada changed over to manufacture in August of a 70% synthetic product, built with nylon instead of cotton thread and replacing the 100% crude tires which Canadian plants had been making entirely heretofore. With the industrial expansion stage of the war passed, it is considered unlikely that there will be plant expansion to allow manufacture of more civilian tires. As a result, civilian users are not likely to obtain any major relief until the production of tires for war purposes slackens.

Polymer Corp., Sarnia, Ont., was visited August 10 by a group headed by J. W. Livingstone, vice president of Rubber Reserve Corp., Washington, D. C., and consisting of about 30 officials of United States styrene, butadiene, and carbide plants. All are members of Rubber Reserve technical committees which had been meeting during the week at St. Clair, Mich. R. C. Berkinshaw, Polymer president, and J. R. Nicholson, general manager, entertained the visitors at luncheon.

G. M. Kintz, safety engineer, United States Bureau of Mines, Washington, supervised demonstrations, August 7 and 8, at Polymer Corp. on how to avoid explosions and fire in the handling of gasoline and its derivatives used in the manufacture of synthetic rubber. He was assisted by H. Brown, also of the Bureau, and Don Hyatt, of Rubber Reserve. Attending were employes of Imperial Oil, Ltd., St. Clair Processing Corp., Canadian Synthetic Rubber Co., Dow Chemical of Canada, and Polymer Corp.

Flight Lt. David E. Hornell, 34, employed by the Goodyear Tire & Rubber Co. of Canada, Ltd., for 17 years before his enlistment in the Royal Canadian Air Force, was awarded the Victoria Cross posthumously.

Courtaulds (Canada), Ltd., Montreal P. Q., at the direction of the Canadian government, now is switching 24 machines at its Cornwall, Ont., plant to the manufacture of viscose yarn for tire cords to meet urgent wartime needs. The company reports that about half of this year's estimated output of 12½ million pounds of viscose yarn will be high-tenacity viscose for use in synthetic rubber tire cord fabrics.

War Expenditures Committee, in a report tabled in the House of Commons, Ottawa, Ont., August 12, recommended that ownership of the Polymer Corp. synthetic rubber plant at Sarnia, Ont., be retained by the crown and that the plant be operated after the war by the government. A week earlier Commons heard a report that the Dominion Government has received several offers from private enterprises for the Polymer plant, but C. D. Howe, Minister of Munitions, said that there was no immediate intention of disposing of the plant.

Gutta Percha & Rubber, Ltd., West Lodge Ave., Toronto 3, Ont., has appointed C. S. Pope manager of the export department, replacing Leonard L. McMurray, now retired. Mr. Pope, assistant manager of the department for ten years, started as clerk with the company in 1919 after five years overseas in the last war.

On June 30 after 52 years with the company, Mr. McMurray retired on pension. Mr. McMurray has for many years been an active member of the Canadian Manufacturers' Association and has rendered valuable service particularly in the Commercial Intelligence Committee of which he has been a member since 1921, serving as chairman in 1922-23. He still holds office as chairman of the Export Club of Toronto and District, to which post he was elected some years ago.

F. C. Hayes, administrator of shipping cases, Wartime Prices & Trade Board, has granted permission to increase the maximum area of new rubber printing dies from 50 to 500 square inches. The dies, used for printing on shipping containers, were first restricted in size in 1942 to conserve rubber, but the supply of reclaimed rubber now is sufficient to permit the larger size. The revised order makes no change in the arrangement among certain manufacturers of shipping containers to use each other's printing dies.

Seiberling Rubber Co. of Canada, Ltd., Toronto, Ont., is selling a new issue of $500,000 first closed mortgage bonds, consisting of one- to five-year serial 3½% bonds with $20,000 maturing each year and $400,000 5% sinking fund bonds maturing September 1, 1959. The bonds are to be offered at 100, and it is reported that the serial bonds already are sold. Capitalization of the company, prior to this issue, consisted of an authorized issue of 50,000 shares of no par value common stock, of which 31,135 shares were issued and outstanding.

Seiberling also is making additions and improvements to plant and equipment to satisfy demands for peacetime needs, according to R. J. Thomas, president. War goods being produced are essentially similar to peacetime products, and it is expected that the changeover can be effected without any undue lag in production.

Annual Index Available

Owing to the paper shortage, our annual index is not incorporated, as usual, in our October issue. Anyone, however, desiring copies of the index covering Volumes 109-110 (October, 1943-September, 1944) of INDIA RUBBER WORLD, may secure them by phoning this office (MOhawk 4-1760) or writing to 386 Fourth Ave., New York 16, N. Y.

OBITUARY

Carl H. Rupprecht

CARL H. RUPPRECHT, 57, general manager of the pigments department of E. I. du Pont de Nemours and Co., Inc., died September 10 at East Orange, N. J., after an illness of several months. A native New Yorker, he had been identified with the pigments industry throughout his life. His early associations included the Fred L. Lavanburg Co., and George Lueders & Co., both of New York. Mr. Rupprecht joined the du Pont company in 1919 in Chicago, Ill., and became sales manager in Chicago in 1920, district sales manager there in 1921, and general sales manager in Wilmington, Del., in 1924. Then Mr. Rupprecht was transferred to Cleveland as sales manager of the pigments division of the Grasselli Chemical Co. in 1929 after du Pont had acquired that firm, and in 1930 the deceased was appointed manager of what was then the du Pont pigments division with headquarters at Newark. In 1931 on the formation of the Krebs Pigment & Color Corp. he was elected president and a director. The Krebs Pigments Department was established in 1935, and Mr. Rupprecht was named general manager.

Funeral services were conducted from the Colonial Home, East Orange, September 12. Interment took place in Middle Village, L. I.

Two brothers survive.

John A. Brown

JOHN ALBERT BROWN, president of Socony-Vacuum Oil Co., Inc., New York, N. Y., died September 9 in a hospital in Montreal, P. Q., Canada, following an operation. He was born in Hampton, Pa., 59 years ago, and was graduated from Girard College in 1901.

In 1911, after engaging in other fields, Mr. Brown entered the oil business, and after association with several firms in various capacities he became in 1933 the president and chairman of the executive committee of Socony-Vacuum. He was also a director of several other companies and associations and of wartime government committees for the petroleum industry, and a member of several social and fraternal organizations.

Funeral services were held September 12 at St. Bartholomew's Episcopal Church, New York, and cremation was at the Fresh Ponds Crematory, Middle Village, Queens, L. I.

Survivors include a wife and a sister.

W. M. Vermilye

WILLIAM MOORHEAD VERMILYE, 64, a director of Wilmington Chemical Corp., 10 E. 40th Street, New York, N. Y., died on August 29 of a heart attack in Hershey, Pa. Mr. Vermilye, who retired this year as vice president of the National City Bank, endowed the Vermilye Medal awarded by the Franklin Institute of Pennsylvania for contribution to industrial management. He was also chairman of the national committee of the Franklin Institute and was a director of the Virginia-Carolina Chemical Corp. From 1923 to 1930 Mr. Vermilye was executive vice president of the National Aniline & Chemical Co.

He leaves a widow, a son, three daughters, and six grandchildren.

Walter S. Landis

A HEART ATTACK caused the death, on September 15 at his home in Old Greenwich, Conn., of Walter Savage Landis, since 1922 vice president and a director of American Cyanamid Co., Rockefeller Plaza, New York, N. Y. He had joined the company in 1912 as its chief technologist. He was also a director of several other business concerns.

His birthplace was Pottstown, Pa.; the date, July 5, 1881. Dr. Landis was educated in the public schools of Orlando, Fla., and Pottstown, Bethlehem Preparatory School and Lehigh University, graduating in 1902 a metallurgical engineer. He won his M.S. from Lehigh in 1906 and an honorary D.S. in 1922. The deceased, moreover, served his Alma Mater as an assistant in minerology and metallurgy (1902-1903), an instructor (1903-1907), an assistant professor (1907-1908), and as an associate professor of metallurgy (1910-1912). He had written many technical books and articles and taken out about 50 patents here and abroad.

He was a member of the American Chemical Society and a past chairman of its New York Section, a past president of The Electrochemical Society and of the Chemists' Club, and a member of the American Institute of Chemical Engineers and of the American Institute of Mining & Metallurgical Engineers. Dr. Landis, furthermore, was awarded the Chemical Industries Medal in 1936, the Perkin Medal in 1939, and the American Institute of Chemists medal in 1943.

On September 18 funeral services were conducted at the First Congregational Church, Old Greenwich, where interment also took place.

Survivors include the widow, two sons, and a sister.

William A. Anderson

WILLIAM A. ANDERSON, president of John A. Roebling's Sons Co., Trenton, N. J., died September 10 at his home near Princeton, N. J., after an illness of two months. He was born at Trenton in 1870 and educated at the Lawrenceville Preparatory School.

In 1888, Mr. Anderson joined the Roebling company as a timekeeper in its wire mills. He progressed steadily in the organization and in 1922 became a member of the board. In 1923 he was named general manager; in 1927, also first vice president and treasurer; and in 1936, president. Mr. Anderson was also a director of the Otis Elevator Co. and of the Delaware & Hudson Co.

Funeral services were held September 13 at Trinity Episcopal Cathedral, Trenton, and burial was in Ewing Church Cemetery.

Mr. Anderson leaves a wife, two sisters, and a brother.

FINANCIAL

American Cyanamid Co., New York, N. Y. First six months, 1944: net income, $2,222,659, equal, after preferred dividends, to 68¢ each on 2,707,026 common shares, contrasted with $2,934,167 (revised), or 99¢ each on 2,639,026 shares, in the same period last year; provision for taxes and renegotiation adjustments, $7,100,000, against $8,974,555.

American Zinc, Lead & Smelting Co., and wholly owned subsidiaries, Columbus, O. First half, 1944: net income, $358,680, or 28¢ a common share, contrasted with $484,000, or 46¢ a share, in the first six months last year.

Anaconda Wire & Cable Co., New York, N. Y. First half, 1944: net income, $698,874, or $1.66 each on 421,981 capital shares, against $468,431, or $1.11 a share, in the same period last year.

Baldwin Locomotive Works, Philadelphia, Pa., and wholly owned subsidiaries. Year ended June 30: net profit, $4,959,666, or $3.76 each on 1,276,946 common shares, against $5,782,225, or $4.45 each on 1,263,653 common shares, in the preceding 12 months; sales, $227,486,889, against $209,290,724; income taxes, $24,430,000, against $20,916,740.

Baldwin Rubber Co., Pontiac, Mich. Year ended June 30, 1944: net profit, $379,492, or $1.20 a share, subject to renegotiation, contrasted with $284,296 (revised), or 90¢ a share, in the preceding 12 months.

Belden Mfg. Co., Chicago, Ill. First half, 1944: net income, $169,088, equal to 70¢ a share, against $276,818, or $1.15 a share, in the '43 half.

Brown Rubber Co., Inc., Lafayette, Ind. First half: net income, $78,520, equal to 37¢ each on 211,100 capital shares; current assets, $289,249, including $165,124 cash; current liabilities, $140,682.

Canada Wire & Cable Co., Ltd., Toronto, Ont., Canada. Six months to June 30: net profit, $383,000, equal, after preferred dividends, to $10.17 each on 29,669 shares of Class A common stock, against $546,100, or $15.67 a share, for the similar period of 1943; refundable portion of excess profits tax, $91,000, against $274,736.

Columbian Carbon Co., New York, N. Y. First half, 1944: net earnings, before renegotiation, $1,667,870, or $3.10 a share, against $1,502,365, or $2.80 a share, in the same period last year.

Crown Cork & Seal Co., Inc., Baltimore, Md., and wholly owned domestic subsidiaries. First six months, 1944: net profit, subject to renegotiation, $1,091,751, or $1.62 a common share, against $591,797, or 65¢ a share, in the 1943 period.

Dewey & Almy Chemical Co., Cambridge, Mass. First half, 1944: consolidated net profit, $311,029, or $1.03 each on 301,157 shares outstanding, against $289,047, or 98¢ each on 295,317 shares, in the same period last year; net sales, $5,050,038, against $4,103,781.

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., and wholly owned subsidiaries. First half, 1944: net income, $34,052,469, equal, after preferred dividends, to $2.72 each on 11,109,697 common shares, against $29,555,500, or $2.32 each on 11,109,292 common shares, in the corresponding period last year; net sales, $303,390,223, against $275,978,230; provisions for federal income taxes, $65,455,000, against $62,999,000.

Heyden Chemical Corp., New York, N. Y. First half, 1944: net income, $467,256, or 88¢ a share; net sales, $7,899,383.

Electric Storage Battery Co., Philadelphia, Pa., and wholly owned subsidiaries. First half: net income, $1,004,747, or $1.10 a common share, against $1,012,245, or $1.11 a share, in the 1943 half.

Flintkote Co., New York, N. Y., and subsidiaries. Twenty-eight weeks to July 15: net income, $762,073, equal to 71¢ each on 951,608 common shares, against $479,929, or 54¢ each on 713,706 shares, in the corresponding period a year ago; tax provision, $1,748,348, against $840,380; reserve for contingencies, $50,000, against $100,000; net sales, $19,279,548, against $15,374,946.

Garlock Packing Co., Palmyra, N. Y. First half, 1944: net income, $399,583, or $1.90 a common share, compared with $405,368, or $2.15 a share, in the same period last year.

General Cable Corp., New York, N. Y. First half, 1944: net income, $1,125,058, against $1,041,888 for the first six months of '43; provision for federal income taxes, $5,620,000, against $4,670,000.

General Motors Corp., Detroit, Mich. First half, 1944: net profit, $82,769,895, equal to $1.78 a common share, against $64,801,085, or $1.49 a share, in the '43 period; provision for income and excess profits taxes, $139,888,000 against $107,686,000.

General Tire & Rubber Co., Akron. Six months to May 31, 1944: net income, $1,209,560, or $2.02 a common share, against $962,265, or $1.70 a share, in the similar period of 1943; net sales, $33,367,327, against $25,296,563.

B. F. Goodrich Co., Akron, O. Six months to June 30: consolidated net sales, $206,273,349, against $179,161,773 in the first half of 1943; consolidated net income, $5,244,308, equal, after preferred dividends, to $3.23 each on 1,303,255 common shares outstanding, compared with $5,573,879, or $3.49 a common share; provision for income and excess profits taxes, $32,729,000, against $30,773,000; reserve for contingencies, $2,000,000, against $4,000,000.

Goodyear Tire & Rubber Co., Akron, O. Six months to June 30: net sales, $404,707,818, against $366,269,545 in the same period last year; net profit, $7,491,078, equal to $2.89 a common share, against $7,348,529, or $2.82 a share, in the '43 period; provision for contingencies, $2,500,000, against $7,999,612.

Intercontinental Rubber Co., New York, N. Y., and subsidiaries. Six months to June 30: net income, $315,765, against $384,182 in the '43 period; current assets, $2,489,733; current liabilities, $171,712, compared with $2,760,291 and $501,120, respectively, on December 31, 1943.

Master Tire & Rubber Corp., Findlay, O. First six months, 1944: net income, $177,961, or $1.14 a share, against $158,742, or $1.01 a share, in the corresponding period last year; sales, $4,036,062, against $2,836,301.

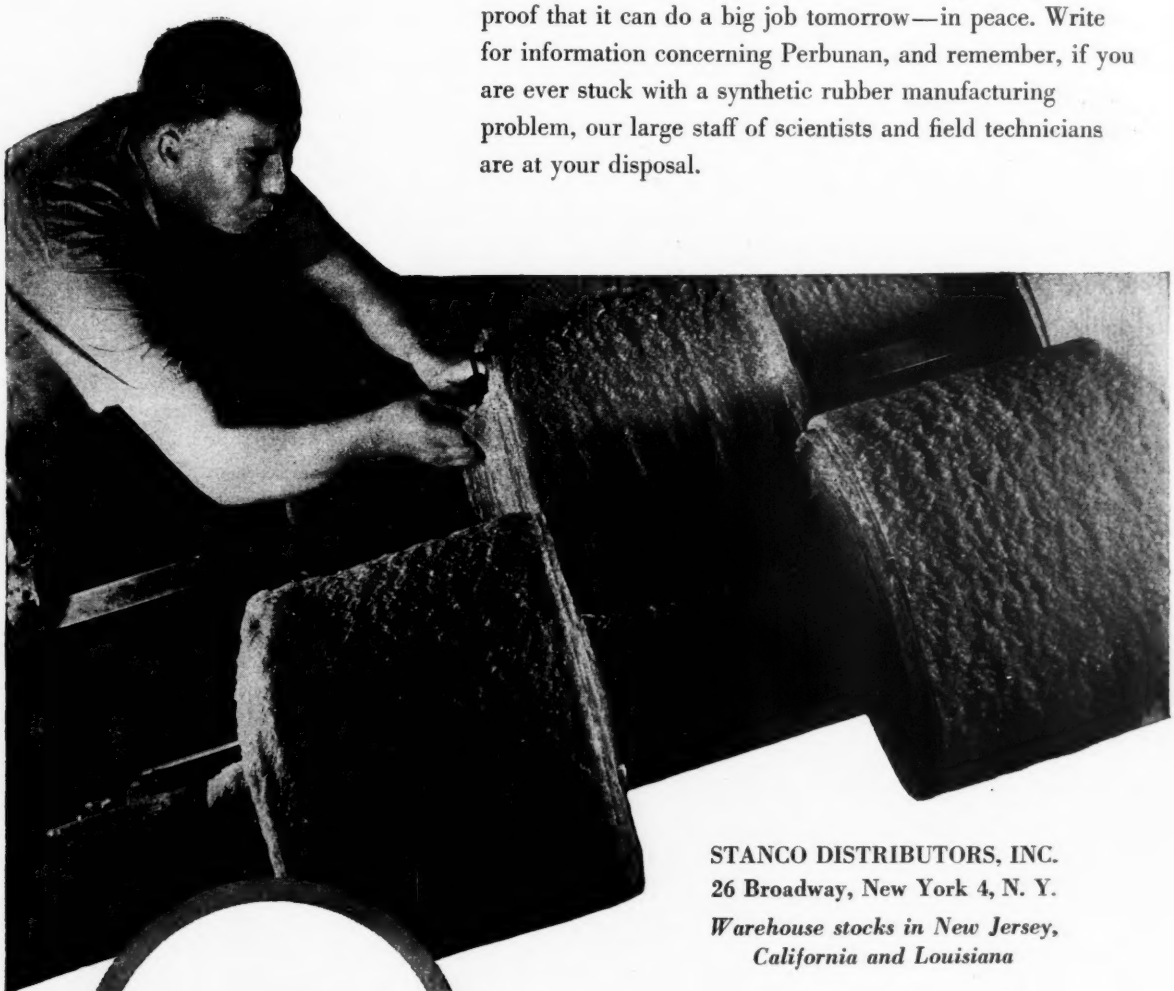
New Jersey Zinc Co., New York, N. Y. Second quarter: net profit, $1,350,968, or 69¢ a capital share, against 76¢ a share in the June '43 quarter. First half, 1944: net profit, $1.38 a share, against $1.53 a share in the 1943 period.

PERBUNAN on the V-Shift

The Perbunan synthetic rubber you see in this milling machine has a pretty big war job to do . . . and it's doing it better than the natural rubber it replaces!

For Perbunan—developed in the great Esso Laboratories of the Standard Oil Development Company, and made all the way from crude oil to finished product at our Baton Rouge plant—resists oil, heat, cold and time as no natural rubber ever could. It's working in warplanes at minus 65°F. and in tanks operating in heat above 160°F.

What Perbunan is doing today—in war—is pretty good proof that it can do a big job tomorrow—in peace. Write for information concerning Perbunan, and remember, if you are ever stuck with a synthetic rubber manufacturing problem, our large staff of scientists and field technicians are at your disposal.



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Monsanto Chemical Co., St. Louis, Mo., and American subsidiaries. Six months ended June 30: net income, $2,412,247, equal to $1.56 a common share, against $2,877,630, or $1.95 a share, in the first half last year; net sales, $40,857,290, up slightly from the '43 figure.

National Lead Co., New York, N. Y. Six months to June 30: net profit, $2,881,028, equal to 60¢ a common share, contrasted with $2,248,954, or 40¢ a share in the 1943 period; provision for taxes, $6,250,906, against $4,754,916; reserve for contingencies, $650,036, against $270,277.

O'Sullivan Rubber Co., Inc., Winchester, Va. For 1943: net income, $276,669, against $143,478 in 1942; taxes, $353,240, against $128,467.

First half, 1944: net income $169,910, or 59¢ a share on subordinated common stock, against $104,992, or 32¢ a share, in the like period last year.

Phelps Dodge Corp., New York, N. Y., and subsidiaries. First half, 1944: net earnings: $6,594,777, equal to $1.30 a share, compared with $6,777,740, or $1.34 a share, a year earlier; sales, $85,103,630, against $78,956,736; reserve for contingencies, $250,000, against $1,000,000; provision for taxes, $10,300,000, unchanged.

Pittsburgh Plate Glass Co., Pittsburgh, Pa. First half, 1944: consolidated net earnings, $6,970,000, or $3.16 a share, against $5,766,000, or $2.61 a share, in the first six months of 1943.

Raybestos-Manhattan, Inc., Passaic, N. J. Six months to June 30: net profit, $880,927, or $1.40 a share, against $811,525, or $1.29 a share, in the 1943 period; taxes, $3,795,000, against $3,212,000; reserve for contingencies, $525,000, against $375,000.

Rome Cable Corp., Rome, N. Y. Year ended March 31, 1944: net profit, $452,976, equal to $2.38 a common share, against $348,916, or $1.82 a share, in the previous 12 months; reserve for contingencies, $100,000, against $50,000; balance to surplus, $352,976, against $298,916. June, 1944, quarter: net income, $125,970, or 66¢ a share, contrasted with $125,914, also 66¢ a share, in the 1943 quarter; provision for federal taxes, $618,100, against $366,160.

St. Joseph Lead Co., New York 17, N. Y. Six months to June 30: consolidated net income, $2,225,287, or $1.12 each on 1,975,456 shares, compared with $2,697,084, or $1.38 each on 1,955,680 shares, in the first half last year; net sales, $25,216,498, against $23,373,152.

Skelly Oil Co., Kansas City, Mo., and subsidiaries. First six months, 1944: net income, $3,403,365 or $3.46 each on 981,348 common shares, compared with $2,566,675, or $2.61 a share, in the June half last year; provision for taxes, $4,323,500, against $2,319,200.

Thermoid Co., Trenton, N. J., and subsidiaries. First six months, 1944: net profit, excluding minority interest, $324,073, or 47¢ each on 600,000 common shares, compared with $319,199, or 57¢ each on 475,000 shares, in the same months last year. However figures for 1944 include results of Joseph Stokes Rubber Co., Precision Roll & Rubber Co., and Joseph Stokes Rubber Co., Ltd.; figures for 1943 do not.

Socony-Vacuum Oil Co., Inc., New York 4, N. Y. First six months, 1944: consolidated earnings, about $20,000,000, equal to 64¢ each on 31,178,323 capital shares outstanding, contrasted with $15,000,000, or 48¢ a share, a year earlier.

Timken Roller Bearing Co., Canton, O. First six months, 1944: net income, $2,896,613, equal to $1.20 a common share, against $3,112,831, or $1.29 a share, in the first half of 1943.

United Carbon Co., Charleston, W. Va., and subsidiaries. First half, 1944: net income, $984,595, or $2.47 a common share, against $947,602, or $2.38 a share, in the corresponding period last year.

United States Rubber Co., New York, N. Y., and subsidiaries. June half: consolidated net income, $5,852,827, equal, after preferred dividend requirements, to $1.85 each on 1,759,092 common shares outstanding, contrasted with $6,912,466, or $2.44 a common share, in the 1943 period; current assets on June 30, $142,795,346, current liabilities, $41,405,429, compared with $154,260,077 and $45,383,031, respectively, on December 31, 1943; inventories, $72,715,669, against $69,580,780 on December 31. During the 1944 half the company retired $2,417,000 of its 3⅝% first mortgage and collateral trust bonds, Series A, due July 1, 1958, thus reducing the oustanding amount to $29,308,000.

New Incorporations

The Barnes Rubber Co., Inc., Cranston, R. I. Capital, 100 common shares, no par value. Alfred J. Curry, Providence, William E. Walsh and Thomas F. Keene, both of Cranston, both in R. I. To manufacture, buy, and sell all kinds of rubber goods.

Excelsior Stamp Works Co., Akron, O. Capital, $20,000. T. F. Foley, H. F. Kolar, and J. D. Horsfall. To manufacture rubber stamps.

Metro Rubber Products Corp., 8116 S. Western Ave., Chicago, Ill. Capital, 100 shares common, par value $100. M. E. Blaul, L. B. Wagner, and D. M. Wagner. To manufacture and sell rubber, plastic, metal, and molded products and molds.

Plastic & Rubber Products, Inc., Dayton, O. Capital, 1,000 common shares, no par value. A. W. Meyring, M. E. Loepker, and H. G. Taylor. To manufacture and distribute plastics and rubber products.

Fixed Government Prices*

	Price per Pound	
Balata	Civilian Use	Other Than Civilian Use
Manaos Block	$0.38¾	$0.38¾
Swinam Sheet	.42½	.42½
Guayule		
Guayule (*carload lots*)	.17½	.31
Latex		
Normal (*tank car lots*)	.26	.43½
Creamed (*tank car lots*)	.26¾	.44½
Centrifuged (*tank car lots*)	.27¾	.45¾
Heat-Concentrated (*carload drums*)	.29½	.47
Plantation Grades		
No. 1X Ribbed Smoked Sheets	.22½	.40
1X Thin Pale Latex Crepe	.22½	.40
2 Thick Pale Latex Crepe	.22	.39½
1X Brown Crepe	.21¾	.38½
2X Brown Crepe	.21½	.38¼
2 Remilled Blankets (Amber)	.21¼	.38¼
3 Remilled Blankets (Amber)	.21⅛	.38¼
Rolled Brown	.18	.35½
Synthetic Rubber		
GR-M (Neoprene GN)	.27½	.45
GR-S (Buna S)	.18½	.36
GR-I (Butyl)	.16½	.33
Wild Rubber		
Upriver Coarse (crude)	.12⅝	.26½
(washed and dried)	.20¼	.37½
Islands Fine (crude)	.14⅝	.28¼
(washed and dried)	.22½	.40
Caucho Ball (crude)	.11⅝	.24⅜
(washed and dried)	.19½	.37
Mangabiera (crude)	.08½	.19⅝
(washed and dried)	.18	.35½

*For a complete list of all grades of all rubbers, including crude, balata, guayule, synthetic, and latex, see Rubber Reserve Co. Circular 17, p. 169, May, 1943, issue.

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record
Boston Woven Hose & Rubber Co.	Com.	$0.50 q.	Aug. 25	Aug. 15
Canada Wire & Cable Co., Ltd.	"B"	0.25 interim	Sept. 15	Aug. 31
Canada Wire & Cable Co., Ltd.	"A"	1.00 q.	Sept. 15	Aug. 31
Canada Wire & Cable Co., Ltd.	Pfd.	1.625 q.	Sept. 15	Aug. 31
Crown Cork & Seal Co.	Pfd.	0.5625 q.	Sept. 15	Aug. 31
Dewey & Almy Chemical Co.	Com.	0.25 q.	Sept. 15	Aug. 31
Dewey & Almy Chemical Co.	"B"	0.25 q.	Sept. 15	Aug. 31
E. I. du Pont de Nemours & Co., Inc.	Com.	1.25 interim	Sept. 14	Aug. 28
E. I. du Pont de Nemours & Co., Inc.	Pfd.	1.125 q.	Oct. 25	Oct. 10
Electric Hose & Rubber Co.	Com.	3.00	Aug. 25	Aug. 15
Electric Storage Battery Co.	Com.	0.50	Sept. 30	Sept. 18
Firestone Tire & Rubber Co.	Com.	0.375	Oct. 20	Oct. 5
Flintkote Co.	$4.50 Pfd.	1.125 q.	Sept. 15	Aug. 25
Flintkote Co.	Pfd.	1.125 q.	Sept. 9	Aug. 19
Flintkote Co.	Com.	0.15	Sept. 9	Aug. 19
Garlock Packing Co.	Com.	0.50	Sept. 30	Sept. 16
General Electric Co.	Com.	0.35	July 25	.....
General Motors Corp.	Com.	0.75	Sept. 9	Aug. 17
GeneralMotors Corp.	Pfd.	1.25 q.	Nov. 1	Oct. 9
B. F. Goodrich Co.	Com.	0.50 q.	Sept. 15	Sept. 1
B. F. Goodrich Co.	$5.00 Cum. Pfd.	1.25 q.	Sept. 30	Sept. 15
Goodyear Tire & Rubber Co.	Com.	0.50	Sept. 15	Aug. 15
Goodyear Tire & Rubber Co.	Pfd.	1.25 q.	Sept. 15	Aug. 15
Hewitt Rubber Corp.	Com.	0.25 q.	Sept. 15	Aug. 31
Midwest Rubber Reclaiming Co.	Pfd.	1.00 q.	Sept. 1	Aug. 21
Mohawk Rubber Co.	Com.	0.50	Oct. 14	Sept. 25
Norwalk Tire & Rubber Co.	Com.	0.20	Sept. 1	Aug. 15
Norwalk Tire & Rubber Co.	Pfd.	0.875 q.	Sept. 29	Sept. 15
Okonite Co.	Com.	1.50 q.	Aug. 1	July 25
Okonite Co.	6% Pfd.	1.50 q.	Sept. 1	Aug. 15
Raybestos-Manhattan, Inc.	Com.	0.375 q.	Sept. 12	Aug. 28
Seiberling Rubber Co.	Pfd.	0.63 q.	Oct. 1	Sept. 15
Seiberling Rubber Co.	"A"	1.25 q.	Oct. 1	Sept. 15
Thermoid Co.	Com.	0.10 q.	Sept. 15	Sept. 1
Thermoid Co.	Pfd.	0.75 q.	Sept. 15	Sept. 1
United Elastic Corp.	Com.	0.35	Sept. 9	Sept

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Cuts Costs 15% to 20% . . . Reduces Cracking, Bleeding, Hardening

When a manufacturer improves the quality of his product without increasing costs he has made progress . . . but when he adds to quality and decreases costs it is a major achievement. That's exactly what a manufacturer of synthetic and reclaimed rubber products accomplished.

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There are fewer rejects of the finished products because cracking, bleeding and hardening have been greatly reduced . . . even after the products have been stored or aged for a considerable time.

15% to 20% more processing oil can be used, increasing the weight of the products. This increased sales value almost pays for the oil used. Savings in processing costs have also been effected . . . so that the net results are far superior products at considerably lower cost.

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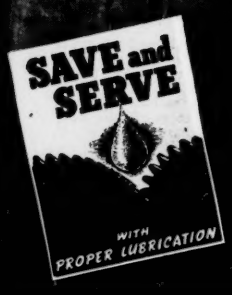

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Patents and Trade Marks

APPLICATION

United States

2,354,669. **Undergarment with Stretchable Sections.** E. Donaldson and F. Chatfield, the latter assignor to Munsingwear, Inc., all of Minneapolis, Minn.

2,354,701. **In a Fuel Tank for Airplanes, Etc., Inner and Outer Shells in Slightly Spaced Relation to Each Other and a Pair of Film-like Flexible Elements between the Shells Providing Sealing Means.** M. G. P. Pescara, Philadelphia, Pa.

2,354,707. **For Protective Clothing, a Fabric Coated with Viscose and Latex Interposed between Treated Layers of Sheepskin.** R. L. Sebastian, New York, N. Y., and H. A. Scruton, Baltimore, Md., assignors to United States of America, as represented by the Secretary of War, and his successors in office, in trust.

2,354,710. **In Mowing Machine with Oscillating Sickle, Pitman for Oscillating the Sickle and Driving Mechanism for the Pitman, a Mounting of Distortable Elastic Material in Compression for the Driving Mechanism.** H. W. Simpson and A. Abgarian, assignors to Detroit Harvester Co., all of Detroit, Mich.

2,354,715. **Pneumatic Tire Having a Tread with Outermost Zones Containing Metallic Reenforcements against Roadway Reaction and under Special Conditions Bearing a Greater Load Than Carried by the Intermediate Portion of the Tread.** J. P. Tarbox, Philadelphia, Pa.

2,354,837. **In Prewelt Shoes, an Elastic Band at the Welted Margin at Opposite Sides of the Shank Portion of the Upper.** E. L. Sawyer, Washington, D. C., assignor to United Shoe Machinery Corp., Flemington, N. J.

2,354,855. **In a Container Closure, a Sealing Element Having a Facing Film of Vinylidene Chloride Resin Adhered to a Base of Compressible Material by an Adhesive Consisting of Polyisobutylene, Hydrogenated Rosin, and a Terpene Polymer.** E. C. Emanuel, assignor to Armstrong Cork Co., both of Lancaster, Pa.

2,354,912. **Safety Inner Tube Having an Exterior Wall and a Double-Walled Partition.** E. Eger, Grosse Pointe Park, Mich., assignor to United States Rubber Co., New York, N. Y.

2,355,012. **Syringe for Dental Hygiene.** G. C. Reifsnyder, Allentown, Pa.

2,355,060. **Life Preserver with a Number of Buoyant Floats of Plastic Material.** E. Eastman, Portland, Ore.

2,355,084. **An Auxiliary Fuel Tank for Airplanes, Consisting of a Streamlined, Hollow Body of Heavy Cotton Duck or Similar Material, the Whole of Which Is Stiffened and Sealed by a Resinous, Waterproof Glue Neutral to Aromatic Fuels.** C. Kurrle, Dayton, O.

2,355,104. **Flat Rubber Pads between Elements of a Railway Truck, Frame and Another Truck Part.** H. M. Pflager, St. Louis, Mo., assignor to General Steel Castings Corp., Granite City, Ill.

2,355,383. **A Welt Insole for Welt Footwear, Including an Insole Blank of One Material and a Preformed Sewing Rib of Resilient Plastic Material.** W. C. Wright, Brookfield, N. H.

2,355,425. **A Brake Mechanism Mounted on Pivot Pins, a Bushing between Each Pin and Its Coacting Brake Mechanism Member; Each Bushing Consists of a Sleeve of Rubber-Like Material Tightly Held between Inner and Outer Metallic Sleeves.** L. C. Daniels, assignor to Sam Moore & Co., both of Cleveland, O.

2,355,456. **Resilient Mounting.** C. Macbeth, Birmingham, England, assignor of one-half to V. G. Loyd, Camberley, England.

2,355,493. **A Hood Cap for Bottles, Etc., of Thin Fibrous Sheet Material, the Border of Which Is Impregnated with a Thin, Penetrating Solution of Benzol and Rubber.** I. L. Wilcox and R. F. Huntley, assignors to Oswego Falls Corp., all of Fulton, N. Y.

2,355,525. **In a Baby Crib, Wall Sections Consisting of a Flat and Rigid Grid-Like Foundation Embedded in Soft Rubber.** B. K. Giesler, Washington, D. C.

2,355,575. **To Prevent a Corset, Girdle, Etc., from Sliding Upward When No Stockings Are Worn, a Resilient, Thigh-Encircling Band Having Stretchable Sections.** C. H. Van Allan, Elmira, N. Y.

2,355,610. **Tubular Balloon from Waterproof and Gas-Tight Paper-Like Material.** E. C. Tuggle, Mosheim, Tenn.

2,355,632. **Black Insulating Tape Coated with Mixtures Including Chlorinated Rubber.** J. M. Coffey, Schenectady, J. L. Pickney, Ballston Lake, and R. L. Griffeth, Delanson, assignors to Mica Insulator Co., Schenectady, all in N. Y.

2,355,666. **Transmission Gearing.** L. B. MacGregor, assignor by direct and mesne assignments to L. & M. Rubber Products, Inc., both of Long Beach, Calif.

2,355,756. **Conduit of Normally Flexible Plastic Material Coated with a Waterproof Material Including Finely Divided Particles of Material in a Carrying Agent of Plastic Material.** A. T. Smith, assignor to Sunlite Mfg. Co., both of Milwaukee, Wis.

2,355,757. **Inflatable Pneumatic Float for a Body Structure.** A. N. Spanel, Princeton, N. J.

2,355,816. **Flexible Strips of Rubber in a Fluid-Tight Closure.** H. G. Morner, New York, N. Y.

2,355,829. **In a Cowl Support Structure for Aircraft, Rubber Blocks for Absorbing Torsional and Radial Forces and Fore and Aft Forces.** J. M. Tyler, West Hartford, Conn., assignor to United Aircraft Corp., East Hartford, Conn.

2,355,864. **In an Electric Terminal for Through Mounting in a Metallic Case Member Having an Aperture therein, Sealing Gaskets of Oil and Heat-Resistant Material.** H. L. Hartzell, Anderson, Ind., assignor to General Motors Corp., Detroit, Mich.

2,355,891. **In a Screening Apparatus, Members of Rubber or Rubber-Like Material for Resiliently Supporting the Screen Body.** W. J. Parks, Shaker Heights, O.

2,355,949. **Printing Plates with Plastic Facing.** C. E. Boutwell, Birmingham, Ala.

2,355,979. **Drain Plug.** J. Keyzer, West Allis, Wis.

2,356,007. **Rubber - Covered Acid - Resistant Roll.** E. W. Sanders, Cuyahoga Falls, assignor to Wingfoot Corp., Akron, both in O.

2,356,023. **Flexible Sheet of Non-Fibrous Organic Plastic Material Having Pyramid-Shaped Depressions and Elevations therein, Combined with Elastic Bands to Permit Transverse as well as Longitudinal Stretching of the Article.** G. J. Alles, assignor to Sylvania Industrial Corp., both of Fredericksburg, Va.

2,356,027. **Bearing Assembly Including a Tubular Member of Fibrous Material Impregnated with a Resinous Binder.** J. Boyd, Forest Hills, and P. R. Eklund, Wilkinsburg, assignors to Westinghouse Electric & Mfg. Co., East Pittsburgh, all in Pa.

2,356,109. **Vinylite Sac for Fountain Pen.** J. Wallace, Cedarhurst, N. Y.

2,356,225. **In a Method of Decorating Fabric, the Use of a Moldable, Vulcanizable Sheet Material.** G. R. Cunnington, Grosse Pointe Park, assignor to National Automotive Fibres, Inc., Detroit, both in Mich.

2,356,232. **In a Well Packer, Having a Tubular Packer Expander Mounted in a Tubing String, a Tubular Elastic Packer Sleeve Surrounding the Tubing below the Expander.** J. J. Fitzpatrick, Oklahoma City, Okla.

2,356,250. **In a Laminated Article Consisting of a Rigid Light-Transmitting Sheet and a Cellulose Acetate Sheet, the Use of a Polymerized Incomplete Polyvinyl Acetal Resin and Glycerol Triricinoleate as Cementing Film.** E. H. Land, Wellesley Farms, Mass., assignor by mesne assignments to Polaroid Corp., Dover, Del.

2,356,337. **Thin Sleeve of Elastic Material as Water Impervious Seal in an Electric Blasting Cap.** A. B. Miller, Newark, Del.; H. E. Miller, administratrix of A. B. Miller, deceased, assignor to Hercules Powder Co., Wilmington, Del.

2,356,424. **Windshield Wiper.** C. R. Paton, Birmingham, assignor to Packard Motor Car Co., Detroit, both in Mich.

2,356,426. **In a Truss Including a Pair of Body-Embracing Springs and a Pair of Cushion Pads, a Rubberized Casing for Each of the Springs and a Rubber Coating for the Pads to Render the Truss Moisture-Proof Wherever It Touches the Body.** M. Portnow, New York, N. Y.

2,356,474. **Mechanical Pencil Eraser.** M. E. Savoie, Cleveland, O.

2,356,508. **Cellular Inner Tube with Air-Supply Tube Located at least Partly in the Inner Tube, for Pneumatic Tires.** A. L. Couturier, Orleans, France; vested in the Alien Property Custodian.

2,356,527. **Composition of Cut Cereal Straw Embedded in a Mass of Vulcanized Rubber Which Has Non-Slipping Properties When Wet with Oil.** J. Mercier, Neuilly-sur-Seine, France; vested in the Alien Property Custodian.

2,356,572. **Elastic Coupling Device with Rubber Balls.** M. Dornig, Milan, Italy; vested in the Alien Property Custodian.

2,356,602. **Stopperless Water Bag.** P. S. Madsen, Bethany, Conn., assignor to the Seamless Rubber Co., New Haven, Conn.

2,356,624. **Fibrous Materials Impregnated with Artificial Resin In a Vehicle Body.** C. Schulz, Berlin-Spandau, and K. Tandetzke, Teltow, both in Germany; vested in the Alien Property Custodian.

2,356,630. **Annular Plastic Sealing Means in a Swing Gate Valve.** C. E. Strecker, Arlington, assignor to Encor Corp., Belleville, both in N. J.

2,356,842. **For a Typewriter, a Feed-Roll with a Jacket of Resiliently Pliable Material.** W. E. Helmond, Clinton, Conn., assignor to Underwood Elliott Fischer Co., New York, N. Y.

2,356,985. **Engine Starter with a Resilient Driving Connection Which Includes an Elastically Deformable Member.** J. W. FitzGerald, deceased, late of Milwaukee, Wis., by M. C. FitzGerald, executrix, assignor to Briggs & Stratton Corp., both of Milwaukee, Wis.

2,357,010. **Loom Picker Including a Loop with Enclosing Wall Composed at Least in Part of Resilient Thermosetting Plastic.** E. K. Krueger, Denver, Colo.

2,357,088. **Milling Cutter Including a Sleeve, Blades around the Sleeve, and a Body of Organic Plastic Connecting Sleeve and Blades.** F. W. Curtis, Springfield, Mass., assignor to Van Norman Co., a corporation of Mass.

2,357,152. **Electric Windshield Wiper.** J. B. Whitted, Glencoe, assignor to Stewart-Warner Corp., Chicago, both in Ill.

2,357,194. **Rubber Core and Rubber Washers for Shockproof Mounting of Optical Means for Indicating the Cutting Edge on a Work Piece.** M. W. Hazelton, Cincinnati, and R. S. Diserens, Mt. Healthy, assignors to Cincinnati Shaper Co., Cincinnati, both in O.

2,357,246. **Container Consisting of Layers of Rubber and Rubber-Impregnated Fabric Lining Covering a Metal Shell.** R. H. Whitmyer, Patchogue, N. Y.

Dominion of Canada

421,427. **Plastic Tubes.** Ortho Products, Inc., Linden, assignee of F. V. Sander, Highland Park, both in N. J., U. S. A.

421,460. **Tire Cord.** H. Dreyfus, London, assignee of T. Jackson, and T. B. Frearson, both of Spondon, both in England.

421,597. **Scabbard of Hard Thermoplastic Resin.** E. L. Beckwith, Brookline, Mass., and C. P. MacIver, Stow, Mass., U. S. A.

421,643. **Rubber Valve Stem.** Dill Mfg. Co., Cleveland, assignee of A. E. Bronson, Shaker Heights, both in O., U. S. A.

421,664. **In Adhesive Tape, an Incompletely Polymerized Chloroprene Component in the Adhesive Mass.** Kendall Co., Boston, assignee of W. Eustis, Newton, both in Mass., and G. R. Orrill, Western Springs, Ill., both in the U. S. A.

421,697. **Insulator for Supporting a Line Conductor, the Body of Which Is of Vulcanized Rubber.** Western Union Telegraph Co., assignee of D. H. Smith and H. H. Wheeler, all of New York, N. Y., U. S. A.

421,707. **Rubber Pierced Nipple-Type Valves for an Air Equalizer Gun.** T. W. Burnam, Whittier, assignee of M. J. Corp, Los Angeles, Calif.

421,802. **Refrigerator Sealing Strip of Soft Rubber.** Canadian Westinghouse Co., Ltd., Hamilton, Ont., assignee of O. H. Yoxsimer, Mansfield, O., U. S. A.

421,843. **Shoe for the Tracks of Track-Laying Vehicles Including a Shoe Frame Having a Body of Rubber Provided with a Floating Insert, and a Removable Tread for the Shoe Secured to the Floating Insert.** Ohio Rubber Co., Willoughby, assignee of C. Saurer, Akron, and C. W. Tyler, Wickliffe, all in O., U. S. A.

421,988. **Vibration Damping Mounting Including Rubber Element.** Lord Mfg. Co., assignee of R. C. Henshaw, both of Erie, Pa., U. S. A.

422,070. **Variable Speed Transmission Including a Pair of V-Belts.** L. E. Shaw, East Orange, N. J., U. S. A.

422,078. **Rotogravure Ink Containing Chlorinated Rubber.** American Cyanamid Co., New York, N. Y., assignee of Calco Chemical Co., Inc., assignee of R. A. Shive and E. H. Kienle, all of Bound Brook, and J. E. Coffee, East Orange, both in N. J., both in the U. S. A.

422,112. **Flexible Insulating Material Including Mica Flakes, Glass Fiber Fabric, and as Bonding Agent, Polyisobutylene.** Canadian Westinghouse Co., Ltd., Hamilton, Ont., assignee of L. R. Hill, Wilkinsburg, Pa., U. S. A.

422,119. **Sheet Material Consisting of a Base of Felted Fibrous Structure and a Composite Impregnating Material Including a Thermoplastic Resin and a Thermoplastic Bituminous Material.** Certain-Teed Products Corp., New York, assignee of M. Croce, Buffalo, both in N. Y., U. S. A.

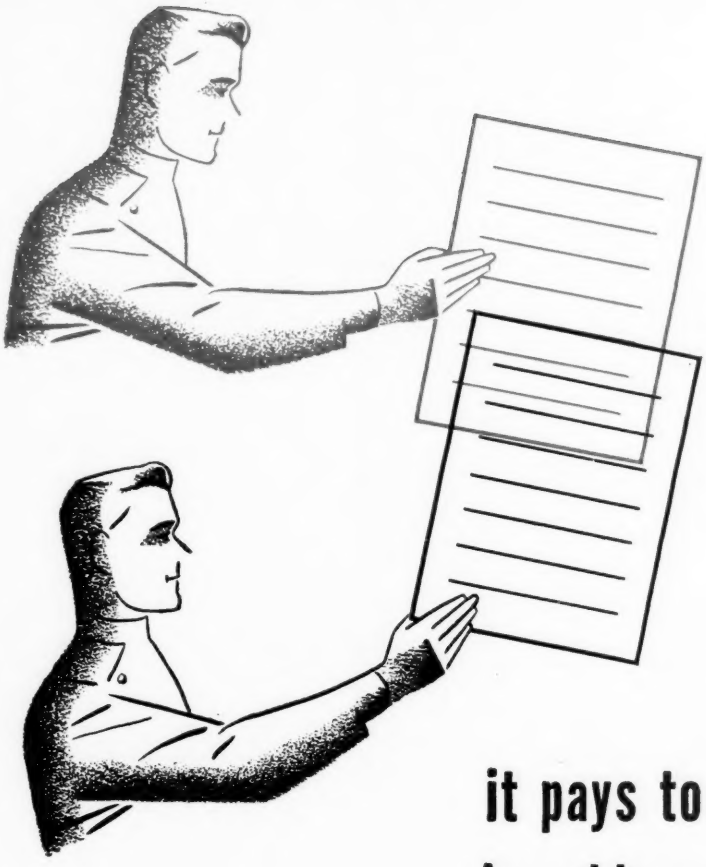
422,120. **Covering Material Composed of a Sheet of Felted Fibrous Material Impregnated with Thermoplastic Resin to Which Is Laminated a Sheet of Felted Fibrous Material Impregnated with Thermoplastic Bituminous Material.** Certain-Teed Products Corp., New York, assignee of L. C. Haack, Kenmore, both in N. Y., U. S. A.

422,132. **Rubber Spring.** Harris Products Co., Cleveland, O., assignee of F. L. Yerzley, Newark, N. J., both in the U. S. A.

422,143. **Resilient Car Wheel with Rubber Elements.** National Malleable & Steel Castings Co., Cleveland, assignee of T. Zintsmaster, Cleveland Heights, both in O., U. S. A.

422,162. **Closure for Hermetical Sealing, Which Includes a Sleeve Gasket of Elastic Sealing Material.** White Cap Co., assignee of W. P. White, both of Chicago, Ill., U. S. A.

422,284. **Strand Wiping Die of Elastically Deformable Material.** Western Electric Co., Inc., New York, N. Y., assignee of C. C. Smith, Cranford, N. J., both in the U. S. A.



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PROCESS

United States

2,354,714. **Heat-Sealing Layers of Similar Plastic Dielectric Materials.** H. A. Strickland, Jr., Detroit, Mich., assignor to Budd Wheel Co., Philadelphia, Pa.

2,354,744. **Shaped Polyvinyl Ester Resin Articles.** C. Dreyfus, New York, N. Y.

2,354,916. **Embossing Flexible Plastic Sheet Material.** V. H. Hurt, Cranston, R. I., assignor to United States Rubber Co., New York, N. Y.

2,355,225. **Forming Deposits of Polyvinyl Alcohol Solutions by Spraying.** W. MacWilliam, Nutley, assignor to Resistoflex Corp., Belleville, both in N. J.

2,356,081. **Injection Molding of Thermosetting Material.** E. E. Novotny, assignor to Durite Plastics, Inc., both of Philadelphia, Pa.

2,356,126. **Two-Ply Ornamented Bathing Caps.** B. Szekeres, Budapest, Hungary; vested in the Alien Property Custodian.

2,356,249. **Belts.** E. H. Kremer and H. W. Kenney, assignors to Dayton Rubber Mfg. Co., all of Dayton, O.

2,356,814. **Improvements in Molding Thermoplastic Materials.** H. G. Bimmerman, Wilmington, Del., and A. L. Fox, Woodstown, N. J., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,356,948. **Covering Flat Furniture Tops with a Woven Fabric of Stretched Rubber Hydrochloride.** E. G. Reed, assignor to Wingfoot Corp., both of Akron, O.

Dominion of Canada

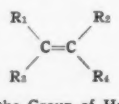
421,995. **Barrier in a Fluid Impregnated Cable.** Northern Electric Co., Ltd., Montreal, P. Q., assignee of T. R. Scott, R. C. Mildner, and T. E. D. Menzies, all of London, England.

422,009. **Applying a Thermoplastic Insulation to an Electric Cable.** Telegraph Construction & Maintenance Co., Ltd., London, assignee of J. N. Dean, Westerham, Kent, and J. Webster, London, both in England.

CHEMICAL

United States

2,354,775. **Resinous Product of the Copolymerization of a Terpene and a Material of the Formula:**



Where R_1 Is of the Group of Hydrogen, Methyl, Chlorine and Bromine; R_2 Is of the Group of Chlorine, Bromine, the Chloromethyl and the Bromomethyl Radicals; R_3 Is of the Group of Hydrogen and Methyl; R_4 Is of the Group of Hydrogen and Methyl; and Where no Additional Halogen Is Present When a Halomethyl Group Is Present. A. L. Rummelsburg, assignor to Hercules Powder Co., both of Wilmington, Del.

2,354,776. **Copolymerization of a Mixture of a Terpene and a Material of the Group of Rosin, Rosin Acids, Rosin Esters, and Rosin Acid Esters in the Presence of a Polymerization Catalyst of the Group of Boron Trifluoride and Its Molecular Complexes with Ethers and Acids, Titanium Chloride, Ferric Chloride, Aluminum Chloride, Ferric Chloride, Stannic Chloride, Zinc Chloride, Hydrofluoric Acid, Fluoric Acid, Orthophosphoric Acid, Tetraphosphoric Acid, and Sulphuric Acid.** A. L. Rummelsburg, assignor to Hercules Powder Co., both of Wilmington, Del.

2,354,868. **Resilient, Plastic Composition Produced from an Extract Obtained by Solvent Extraction of Viscous Petroleum Oil Fractions.** P. V. McKinney and M. G. Mayberry, both of Pittsburgh, Pa., assignors to Pure Oil Co., Chicago, Ill.

2,354,895. **Purification of Dicyclopentadiene.** A. L. Ward, Drexel Hill, Pa., assignor to United Gas Improvement Co., a corporation of Pa.

2,355,146. **Determining the Rubber-Reenforcing Properties of Carbon Black.** S. C. Carney, Bartlesville, Okla., assignor to Phillips Petroleum Co., a corporation of Del.

2,355,180. **Thermoplastic Compound from an Alkaline Solution of Lignin and a Separate Alkaline Solution of Wheat Gluten, Mixed Together and Then Coagulated by the Addition of an Acid.** M. de B. Remy, Detroit, Mich.

2,355,245. **Water Soluble High-Molecular-Weight Condensation Polymer of an Alkyl Glycoside.** R. S. Schreiber and J. H. Werntz, assignors to E. I. du Pont de Nemours & Co., Inc., all of Wilmington, Del.

2,355,265. **Improving Textile Materials by Treating with the Reaction Product of Formaldehyde and a Malonamide.** L. H. Bock, Huntington Valley, and A. L. Houk, assignors to Rohm & Haas Co., both of Philadelphia, Pa.

2,355,335. **Separating a Mercaptan from the Corresponding Alcohol by Esterifying the Alcohol with Boric Acid and Separating the Mercaptan from the Ester by Distillation.** W. L. Semon, Silver Lake, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,355,442. **Esters of Higher Fatty Acids and Alkylol Amine Hydrohalides.** D. W. Jayne, Jr., Old Greenwich, and H. M. Day, Cos Cob, both in Conn., assignors to American Cyanamid Co., New York, N. Y.

2,355,521. **Impregnating a Cotton Fiber Fleece with a Bath Consisting of Latex, an Aqueous Casein Solution, an Aqueous Suspension of Soya Bean Flour, Sulphonated Oil as a Wetting Agent, and Enough Sulphur to Cure.** G. Ganz, London, England.

2,355,822. **Filter Medium of Filaments of a Vinyl Resin Produced by Conjoint Polymerization of a Vinyl Halide with a Vinyl Ester of an Aliphatic Acid.** E. W. Rugeley, Charleston, W. Va., assignor to Carbide & Carbon Chemicals Corp., a corporation of N. Y.

2,335,972. **Removing 1 Mol of Hydrogen Sulphide from 1 Mol of 2-Hydroxy-1-Dithionaphthoic Acid.** A. F. Hardman, assignor to Wingfoot Corp., both of Akron, O.

2,356,001. **Producing Substantial Yields of Alkyl Substituted Cyclohexanes from Alkyl Cyclopentanes by Reacting an Alkyl Cyclopentane with an Olefin Hydrocarbon in the Presence of an Acid of Phosphorus.** H. Pines and V. N. Ipatieff, assignors to Universal Oil Products Co., all of Chicago, Ill.

2,356,005. **Bonding a Gelatin-Glycerine Composition to a Structural Metal by Means of a Solution of an Air-Curing Adhesive Containing Organic Diisocyanate and a Natural or Buna Rubber.** G. F. Roquemore, assignor to Wingfoot Corp., both of Akron, O.

2,356,025. **Lacquer Emulsion of the Oil-in-Water Type, Consisting of an Ethyl Cellulose Lacquer and Water and the Reaction Product of Hydrogenated Rosin with a Volatile Alkali.** C. E. Bergamini, Bloomfield, N. J., assignor to Hercules Powder Co., Wilmington, Del.

2,356,079. **Cellulose Fibers with Increased Affinity to Acid Wool Dyestuffs and Having Deposited Therein a Synthetic Polymer Obtained by Reacting an Aromatic Diisocyanate and a Mixture including N.N′.N″ Trimethyldiethylenetriamine and N.N′.N″.N‴-Tetramethyltriethylenetetramine.** J. Nelles, Leverkusen-Schlebusch, O. Bayer and W. Tischbein, Leverkusen-I. G. Werk, and F. Baehren, Dormagen, Kasino, all in Germany, assignors by mesne assignments to General Aniline & Film Corp., New York, N. Y.

2,356,091. **Copolymer Obtained by Emulsion Copolymerization of a Polymerizable Monomeric Compound of the Class of Methacrylic Acid and Its Derivatives Which Form Methacrylic Acid When Subjected to Hydrolizing Conditions and a Member of the Group of Sulphur-Modified Polymers of 2-Halo-1, 3-Butadienes and Sulphur-Modified Interpolymers of 2-Halo-1, 3-Butadienes with Compounds Containing the Group $CH_2=$.** M. J. Roedel, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,356,128. **Preparing a Solid Plastic, Hydrocarbon Interpolymer by Reacting a Major Portion of an Aliphatic Isoolefin with a Minor Portion of a Conjugated Aliphatic Diolefin, with, as Catalyst, Aluminum Chloride Dissolved in an Organic Solvent That Is Non-Reactive with Aluminum Chloride.** R. M. Thomas, Union, and W. J. Sparks, Cranford, both in N. J., assignors by mesne assignments to Jasco, Inc., a corporation of La.

2,356,129. **Preparing a Solid Plastic Hydrocarbon Interpolymer Reactive with Sulphur to Give an Elastic Product by Reacting a Major Proportion of an Aliphatic Isoolefin Having 4 to 7 Carbon Atoms per Molecule, with a Minor Proportion of an Aliphatic Diolefin Having 5 Carbon Atoms per Molecule in the Presence of a Friedel-Crafts Catalyst Dissolved in a Solvent Which Forms no Complex with the Catalyst.** W. J. Sparks, Elizabeth, and R. M. Thomas, Union, both in N. J., assignors by mesne assignments to Jasco, Inc., a corporation of La.

2,356,130. **Preparing a Solid Plastic Hydrocarbon Interpolymer Reactive with Sulphur to Give an Elastic Product, by Reacting a Major Proportion of an Aliphatic Isoolefin Having 4 to 7 Carbon Atoms per Molecule with a Minor Proportion of an Aliphatic Diolefin Having 6 Carbon Atoms per Molecule in the Presence of a Friedel-Crafts Catalyst Dissolved in a Solvent Which Forms no Complex with the Catalyst.** R. M. Thomas, Union, and W. J. Sparks, Elizabeth, both in N. J., assignors by mesne assignments to Jasco, Inc., a corporation of La.

2,356,163. **Vulcanizing Rubber in the Presence of a Compound of the Formula:**

Where R_1 Is an Organic Radical with the Free Valence on a Carbon Atom, A Is an Alkylene Group Containing not More Than 3 Carbon Atoms and with the Free Valences on Different Carbon Atoms, and R_2 and R_3 Are Hydrogen Atoms. P. C. Jones and R. A. Mathes, both of Akron, O., assignors to B. F. Goodrich Co., New York, N. Y.

2,356,170. **Vulcanizing Rubber in the Presence of an Aminoalkyl Sulphide Containing no More Than 4 Sulphur Atoms and no More Than 3 Carbon Atoms in the Alkyl Chain between the Sulphur and Nitrogen Atoms; This Aminoalkyl Group Contains no Substituent Groups Other Than Hydrogen and Aliphatic Hydrocarbon Groups.** R. A. Mathes, Akron, and P. C. Jones, Silver Lake, both in O., assignors to B. F. Goodrich Co., New York, N. Y.

2,356,171. **Composition of Matter Which Is the Addition Product Obtained by Mixing Sulphur with an Aminoalkyl Sulphide.** R. A. Mathes, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,356,172. **Composition of Matter Which Is the Addition Product of a Zinc Salt of a Heterocyclic Nitrogen-containing Mercaptan with an Aminoalkyl Sulphide.** R. A. Mathes, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,356,247. **Producing Methyl Methacrylate by Pyrolizing a Mixture of Acetic Anhydride and Methyl Alpha-Hydroxyisobutyrate in the Presence of a Phosphoric Acid Catalyst.** P. M. Kirk, Stamford, and P. P. McClellan, Old Greenwich, both in Conn., assignors to American Cyanamid Co., New York, N. Y.

2,356,252. **Shatterproof Structure.** E. H. Land, Boston, Mass., assignor to Polaroid Corp., Dover, Del.

2,356,265. **4-Mercaptobenzenesulphonamide.** E. H. Northey, Bound Brook, N. J., assignor to American Cyanamid Co., New York, N. Y.

2,356,282. **Stabilizing Polyvinyl Alcohol by Treating It in Discrete Form in a Bath of a Lower Aliphatic Saturated Monohydric Alcohol and Water.** G. S. Stamatoff, Rutherford, N. J., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,356,354. **Waterproof Adhesive Tape Prepared by Calendering a Mass Containing Cellulose Acetate, Plasticizer, Pigment and Oleic Acid on a Thin Sheeting and Then Applying a Rubber Pressure-Sensitive Adhesive Mass to the Opposite Side of the Sheet.** E. A. Rodman, Newburgh, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,356,384. **A Process in Which an Indene-Styrene Homolog Fraction Is Heated to Effect Partial Polymerization of Polymerizable Constituents; the Partially Polymerized Fraction Is Distilled to Separate as Residue the Heat Polymer Formed, and the Distillate Oil Containing Polymerizable Bodies Is Polymerized with a Clay Catalyst.** E. L. Cline, Philadelphia, Pa., assignor by mesne assignments to Allied Chemical & Dye Corp., a corporation of N. Y.

2,356,388. **Plasticizing Rubber by Milling in the Presence of a Condensation Product of Formaldehyde with a Substance of the Group of Piperidine and Morpholine, and Hydrogen Sulphide.** R. T. Dean, Stamford, Conn., assignor to American Cyanamid Co., New York, N. Y.

2,356,449. **Producing Colorless, Color-Stable Phthalic Anhydride.** K. H. Engel, West Englewood, and H. L. Stasse, Hawthorne, N. J., assignors by mesne assignments to Allied Chemical & Dye Corp., a corporation of N. Y.

2,356,459. **Producing a Beta Hydroxy Carboxylic Acid Lactone.** F. E. Kung, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,356,471. **Carbon Black of Fine Particle Size.** J. Rehner, Jr., Wadsworth, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,356,479. **Polyvinyl Acetal Resin in Which at Least a Part of the Acetal Groups are Alkoxyacetaldehyde Acetal Groups of the Group of Methoxyacetaldehyde and Ethoxyacetaldehyde Acetal Groups.** D. R. Swan, assignor to Eastman Kodak Co., both of Rochester, N. Y.

2,356,480. **Polyvinyl Acetal Resin in Which Part of the Acetal Groups Are Acetaldehyde Acetal Groups and the Remainder are Branched-Chain Saturated Aliphatic Aldehyde Acetal Groups Containing from 5 to 8 Carbon Atoms.** D. R. Swan, assignor to Eastman Kodak Co., both of Rochester, N. Y.

2,356,494. **Polymerization of Cyclopentadiene-Type Compounds.** S. G. Trepp, Swarthmore, Pa., assignor to United Gas Improvement Co., a corporation of Pa.

2,356,516. **Hydrophilic Linear Polyamides.** M. Hagedorn, Dessau, Germany; vested in the Alien Property Custodian.

2,356,549. **Removing Insoluble Metal Compounds from Aqueous Rubber Dispersions.** G. J. v.d. Bie, Buitenzorg, Java; vested in the Alien Property Custodian.

2,356,562. **Subjecting Vinyl Chloride in the Vapor Phase to the Action of an Aqueous Solution of an Alkali Metal Hydroxide to Remove Impurities Which Tend to Promote Low Molecular Weight Polymers.** H. Berg and H. Mader, both of Burghausen, Oberbayern, Germany; vested in the Alien Property Custodian.

2,356,564. **To Manufacture Articles Resistant**

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Keeps Neoprene Flexible Even at 60° Below!

● **Arctic cold has little harmful effect on Neoprene cable coverings when Neoprene is processed with S/V Sovaloid L. This superior plasticizer makes the rubber flexible at temperatures as low as 60 degrees below zero... Other advantages are its ability to decrease the *rate* of stiffening at low temperatures, and to produce stocks of high tensile strength and increased elongation at the break. S/V Sovaloid L is available right now.**

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to Discoloration by Light from Rubber Mixes Containing a Light Stainable Antioxidant of the Group of Aldol Naphthylamine and Phenyl Naphthylamine, the Incorporation, besides Accelerator and Antioxidant, of an Aqueous Solution of Dimethylolurea, into the Rubber Mix; Then Vulcanizing, When the Dimethylolurea Polymerizes, Forming a Protective Screen of Synthetic Resin Opaque to Ultra-Violet Rays. A. Chomette, Neuilly sur-Seine, and R. Thiollet, Paris, both in France; vested in the Alien Property Custodian.

2,356,586. **Plastic Material Consisting of a Polymerization Product of Polyvinyl Chloride and an Ester of Thio-Diglycol with a Monobasic Aliphatic Carboxylic Acid.** W. Hentrich and R. Endres, Dessau-Rossau, Germany; vested in the Alien Property Custodian.

2,356,604. **Composition of Matter Which Is the Addition Product of a Mercaptan with an Aminoalkyl Sulphide.** R. A. Mathes, Akron, and P. C. Jones, Silver Lake, both in O., assignors to B. F. Goodrich Co., New York, N. Y.

2,356,702. **High Molecular Linear Polyamides.** P. Schlack, Berlin-Treptow, Germany; vested in the Alien Property Custodian.

2,356,710. **A Member of the Class of Sulphuric Acid Conversion Product of an Alkyl-Substituted-2-Mercapto Dihydro Pyrimidine and Its Metal Salts.** C. H. Stiteler, Naugatuck, Conn., assignor to United States Rubber Co., New York, N. Y.

2,356,718. **A Colloidal Aqueous Solution of a Partially Polymerized Positively Charged Guanamine-Formaldehyde Condensation Product.** H. P. Wohnsiedler, Darien, and W. M. Thomas, Stamford, both in Conn., assignors to American Cyanamid Co., New York, N. Y.

2,356,719. **A Colloidal Aqueous Solution of a Partially Polymerized Positively Charged Ammeline-Formaldehyde Condensation Product.** H. P. Wohnsiedler, Darien, and W. M. Thomas, Stamford, both in Conn., assignors to American Cyanamid Co., New York, N. Y.

2,356,764. **Water-Insoluble, Film-Forming Condensation Product Produced by Condensing Butane-diol-1.4-di-normal Propl Ether-$\omega\omega'$-Diamine with Carbon Disulphide to Form the Corresponding Monoamino Dithiocarbamic Acid; Dissolving the Acid in Caustic Soda Solution of about 25%; and Heating the Formed Clear solution.** R. Kern, Ludwigshafen-on-the-Rhine, Germany; vested in the Alien Property Custodian.

2,356,840. **Continuous Process for the Separation of Butadiene in the Form of the Monomeric Sulphone from a C_4 Hydrocarbon Mixture Containing Butadiene, Butane, and Butene.** F. E. Frey and R. D. Snow, Bartlesville, Okla., assignors to Phillips Petroleum Co.

2,356,871. **Resinous Product of the Conjoint Polymerization of a Mixture of Vinyl Chloride and a Compound of the Group of Allyl Chloride and Methallyl Chloride.** E. W. Moffett and R. E. Smith, both of Milwaukee, Wis., assignors to Pittsburgh Plate Glass Co., Pittsburgh, Pa.

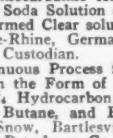
2,356,879. **Lustrous Coatings for Materials Like Leather, Oilcloth, and Vulcanized Fiber, Obtained with a Solution of a Salt of the Free Acid from the Interpolymerizate from Maleic Anhydride and Vinyl Butyl Ether, and Subsequent Glazing.** W. Pense and W. Asch, Frankfurt a.M., P. May, Ludwigshafen-on-the-Rhine, and H. Stark, Bad Soden in Taunus, all in Germany; vested in the Alien Property Custodian.

2,356,882. **Improvements in the Preparation of Aqueous Disperions of Thermoplastic Hydrocarbons.** R. B. Porter, Jr., Stamford, Conn., assignor to Bennett, Inc., Cambridge, Mass.

2,356,896. **Finely Divided Powders from Tough Thermoplastic Resins.** R. E. Smith, Milwaukee, Wis., assignor to Pittsburgh Plate Glass Co., Allegheny County, Pa.

2,356,925. **Polymerization of Vinyl Halides and Mixtures of Vinyl Halides with Lesser Amounts of Vinyl Esters, in Aqueous Emulsion.** C. F. Fryling, Silver Lake, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,356,929. **Vulcanized Rubber Composition Containing a 3-Methyl-4-Alkyl Phenol in Which the Alkyl Group Contains from 1 to 5 Carbon Atoms, and Having the Formula**



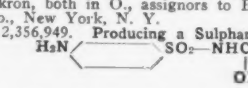
Where X Is a Radical of the Class of Hydrogen, and Alkyl. E. J. Hart, Cedar Grove, N. J., assignor to United States Rubber Co., New York.

2,356,932. **Compound having the Structure**

A—S—Zn—X

Where A Is a Thiazoline Group Attached at the 2-Position to the Sulphur Atom and Contains no Additional Substituent Groups Other Than Hydrogen, Alkyl, Aryl, and Alkoxy Groups, and X is a Salt-Forming Anionic Fatty Acid Residue. P. C. Jones, Silver Lake, and R. A. Mathes, Akron, both in O., assignors to B. F. Goodrich Co., New York, N. Y.

2,356,949. **Producing a Sulphanilylisourea of:**



Where R Is a Hydrocarbon Radical by Reacting a Salt of an Acylsulphanilylcyanamid with an Alcohol in the Presence of a Hydrogen Halide. R. O. Roblin, Jr., Old Greenwich, and G. W. Anderson, Stamford, both in Conn., assignor to American Cyanamid Co., New York, N. Y.

2,356,955. **Clear, Colorless Polyisobutylene with Molecular Weight between 27,000 and 250,000, in Which Is Dissolved a Stabilizing Amount of Sulphur.** R. M. Thomas, Union, N. J., and W. J. Sparks, Alexandria, Va., assignors by mesne assignments to Jasco, Inc., a corporation of La.

2,356,965. **Making an Abrasive Article by Mixing a Liquid Styrene with the Copolymer of Butadiene and Styrene, Adding Curing Agents and Abrasive Grain, Shaping Articles, and Then Curing, thereby Further Polymerizing the Liquid Styrene to Form a Thermoplastic Bond for the Abrasive Grain.** H. V. Allison, Fairfield, assignor to Allison Co., Bridgeport, both in Conn.

2,356,973. **Rubber Hydrochloride Containing a Minor Proportion of an N,N'-Dialiphatic Piperazine.** A. M. Clifford, Stow, assignor to Wingfoot Corp., Akron, both in O.

2,356,974. **Copolymerization of a Mixture of Comonomers Including an Aliphatic Conjugated Diene Hydrocarbon and an Aromatic Compound Containing an Ether Oxygen Atom Directly Connected to a Carbon Atom in the Aromatic Nucleus and also Containing a Polymerizable Olefin Side Chain Directly Connected to Another Carbon Atom in the Aromatic Nucleus.** A. M. Clifford, Stow, assignor to Wingfoot Corp., both in O.

2,356,986. **Separating a Mixture of Butadiene and at Least One 4 Carbon Atom Acetylene into a Fraction Rich in Butadiene and Essentially Free from 4 Carbon Atom Acetylene and a Fraction Rich in the 4 Carbon Atom Acetylene Content of the Mixture.** F. E. Frey, Bartlesville, Okla., assignor to Phillips Petroleum Co., a corporaion of Del.

2,357,016. **Oxidized Mixture of a Polymerized Rosin and a Drying Oil as Binding Agent for Linoleum.** A. B. Miller, Newark, assignor to Hercules Powder Co., Wilmington, both in Del.

2,357,073. **As an Adhesive Composition, a Film-Forming Material That Can Be Solubilized in Aqueous Media and a Glycol Ester of a Rosin Acid.** W. M. Billing, assignor to Hercules Powder Co., both of Wilmington, Del.

2,357,090. **Preparing a Dispersion of a Potentially Reactive Resinous Composition from a Solution of Lignin Dissolved in Phenol and Reacted with Formaldehyde.** G. F. D'Alelio, Pittsfield, Mass., assignor to General Electric Co., a corporation of N. Y.

2,357,091. **Preparing a Potentially Reactive Resinous Composition from a Solution of Extracted Pine Wood Pitch Dissolved in a Phenol and Reacted with Formaldehyde.** G. F. D'Alelio, Pittsfield, Mass., assignor to General Electric Co., a corporation of N. Y.

2,357,100. **Flexible, Transparent, Moisture-Proof Sheet of Non-Fibrous, Cellulosic Material Coated with a Moisture-Proofing Composition Containing Wax and a Thermoplastic Resin-Like Rubber Derivative of the "Plioform" Type.** E. Gebauer-Fuelnegg, Evanston, Ill., and L. K. Eilers and E. W. Moffett, both of Gary, Ind., assignors by mesne assignments to Marbon Corp., a corporation of Del.

2,357,181. **Producing an Acyl Sulphanilylaminoguanidine by Reacting a Salt of a Carboxylic Acid Acylsulphanilyl Cyanamid with a Salt of Hydrazine.** H. E. Faith, Stamford, and P. S. Winnek, Riverside, both in Conn., assignors to American Cyanamid Co., New York, N. Y.

2,357,187. **Hydrophilic Synthetic Linear Polyamides.** M. Hagedorn, Dessau, Germany; vested in the Alien Property Custodian.

2,357,221. **As a Plasticizer for Cellulose Acetate, Cellulose Aceto-Proprionate, Etc., the Resinous Reaction Product of about 37.5% Sebacic Acid, 28.6% Succinic Anhydride, 19.3% Ethylene Glycol, and 14.6% Glycerol.** C. Opp, Cincinnati, O., assignor to Interchemical Corp., New York, N. Y.

2,357,249. **Sulphanilyl Aryl Substituted Guanidines.** G. W. Anderson, Stamford, Conn., assignors to American Cyanamid Co., New York, N. Y.

Dominion of Canada

421,622. **Polymerizing a Homogeneous Mixture of a Solvent Composition of a High Boiling Polymerizably Reactive Organic Substance Containing the Group $CH_2{=}C<$ and a Resin Containing Polymerizably Reactive Alpha, Beta Enal Groups.** American Cyanamid Co., New York, N. Y., assignee of E. L. Kropa, Old Greenwich, Conn., both in the U. S. A.

421,647. **Plastic Composition Including a Cellulose Ether and, as a Modifying Agent, a Triaryl Phosphate.** Dow Chemical Co., assignee of A. L. Bass, T. A. Kauppi, and C. L. Moyle, all of Midland, Mich., U. S. A.

421,655. **Imparting Tack to an Unvulcanized Synthetic Rubber Prepared by Copolymerizing in Aqueous Emulsion a Mixture of Butadiene-1,3 and Acrylonitrile, by Applying to the Rubber Surface a Solution of an Alkyl Phthalyl Alkyl Glycollate in a Volatile Organic Solvent.** B. F. Goodrich Co., New York, N. Y., assignee of D. V. Sarbach, Cuyahoga Falls, O., both in U. S. A.

421,669. **Electric Cable Having a Conductor Insulated with Lappings of Insulating Tape Including Polymerized Material; the Spaces between the Lappings Are Filled with a Stabilized Polymerizable Material.** Northern Electric Co., Ltd., Montreal, P. Q., assignee of T. R. Scott and J. K. Webb, both of London, England.

421,673. **Rubber Chloride.** Raolin Corp., New York, N. Y., assignee of J. W. Raynolds, Pittsburgh, Pa., both in the U. S. A.

421,674. **In Producing Chlorinated Rubber Hydrochloride, the Step of Treating a Dilute Dispersion of Rubber Chloride in an Organic Solvent with Chlorine at a Temperature above 25° C, While Subjecting the Dispersion to Ultra-Violet Radiation, Adding Sufficient Chlorine so That the Final Product Has a Chlorine Content of above 42%.** Raolin Corp., New York, N. Y., assignee of W. M. Kutz, Pittsburgh, Pa., both in the U. S. A.

421,675. **Process to Prevent Film Formation in the Production of Chlorinated Rubber Containing above 64% Fixed Chlorine.** Raolin Corp., New York, N. Y., assignee of W. M. Kutz, Pittsburgh, Pa., and G. A. Webb, Akron, O., all in the U. S. A.

421,680. **Treating the Addition Product of an Olefin and a Nitrosyl Halide, the Addition Product Containing a Replaceable Halogen Atom, to Replace the Halogen Atom with a Radical Including a Water-Solubilizing Group.** Solvay Process Co., New York, assignee of L. J. Beckham, Syracuse, both in N. Y., U. S. A.

421,700. **Plastic Masses Including a Polymerized Keto Ester of an Acid from the Group of Acrylic Acid, Alpha Alkyl Acrylic Acids and Itaconic Acids, in Which the Carbon Atom Attached to Carboxyl Oxygen Carries at Least One Hydrogen Atom.** Wingfoot Corp., Akron, assignee of A. M. Clifford, Stow, both in O., U. S. A.

421,709. **Plastic Composition Containing an Organic Derivative of Cellulose and the Succinic Acid Ester of Butylene Glycol as Plasticizer.** C. Dreyfus, New York, N. Y., assignee of J. E. Bludworth, Cumberland, Md., both in the U. S. A.

421,763. **Composition of Rosin and an Amino-Triazine-Aldehyde Condensation Product.** American Cyanamid Co., New York, N. Y., assignee of H. J. West, Riverside, Conn., both in the U. S. A.

421,764. **Molding Composition Including a Filler, an Acid Curing Agent, and the Condensation Product of an Aldehyde with the Material Obtained by Heating Dicyandiamide and a Phenol with Evolution of Ammonia.** American Cyanamid Co., New York, N. Y., assignee of F. J. Groten and J. H. Lower, both of Stamford, Conn., both in the U. S. A.

421,766. **Finishing Textiles with an Emulsion of a Mixture of Synthetic Resins at Least One of Which Is a Phthalic Anhydride-Polyhydric Alcohol, and One of Which Is a Urea-Formaldehyde Resin.** American Cyanamid Co., New York, N. Y., assignee of D. W. Light and A. D. Nute, both of Stamford, Conn., U. S. A.

421,767. **Finishing Textiles with a Finishing Composition Containing a Water-Insoluble Guanamine in Which the Substituent Groups Contain at Least 7 Carbon Atoms, and also Containing a Curable Aldehyde Condensation Product of a Member of the Group of Melamine, Urea and Thiourea.** American Cyanamid Co., New York, N. Y., assignee of H. W. Stiegler, Falls Church, Va., L. W. Fluck, Jr., South Norwalk, and J. T. Thurston, Cos Cob, both in Conn., all in the U. S. A.

421,768. **Finishing Textiles with an Agent Containing an Aldehyde Condensation Product of a Water-Insoluble Guanamine Having a Member of the Group of Aliphatic and Cycloaliphatic Radicals Containing at Least 7 Carbon Atoms Directly Attached to the 2-Carbon Atoms thereof by a Carbon-to-Carbon bond.** American Cyanamid Co., New York, N. Y., assignee of J. T. Thurston, Cos Cob, Conn., both in the U. S. A.

421,821. **Shoe Bottom Filler That May Be Stored and Is Easily Spreadable at Normal Temperatures, Consisting of Ground, Solid Materials in Rubber Solvent, Mixed with Rubber Cement, and Dissolved Wax.** General Tire & Rubber Co., Akron, O., assignee of H. M. Dodge and R. J. Bush, both of Wabash, Ind., both in the U. S. A.

421,969. **Cellular Rubber Articles from Aqueous Rubber Dispersions.** Firestone Tire & Rubber Co., Akron, O., assignee of M. Carter, Trenton, N. J., both in the U. S. A.

421,971. **Composition Consisting of Polyvinyl Chloride, a Plasticizer of the Class of Hydrocarbon Esters of Dicarboxylic Acids and Barium Oxide.** B. F. Goodrich Co., New York, N. Y., assignee of G. H. Taft, Hudson, O., both in the U. S. A.

421,991. **Water-Dispersed Rubber Containing Adhesive.** Minnesota Mining & Mfg., Co., assignee of H. N. Stephens, both of St. Paul, Minn., U. S. A.

421,992. **Composition Consisting of Polystyrene, and a Substantially Completely Chlorinated Diphenyl.** Monsanto Chemical Co., St. Louis, Mo., assignee of R. F. Hayes, North Wilbraham, Mass., U. S. A.

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"Hercules outstanding record in the field of terpene and rosin chemistry was made possible by the teamwork of operating men and a laboratory staffed by industry-minded research chemists, physicists, and chemical engineers. They transformed wood rosin, wood turpentine, and little-known pine oil into an array of purified products, tailor-made for special purposes, that today are indispensable to scores of the nation's leading industries.

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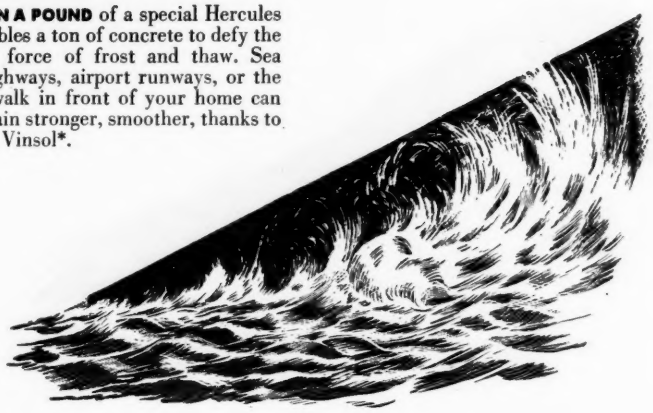
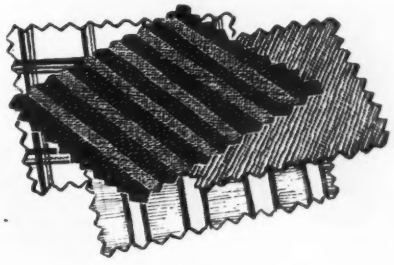
DAVID DIETZ, *Science Editor of the Scripps-Howard Newspapers, Author, and Pulitzer Prize Winner*

SS THAN A POUND of a special Hercules sin enables a ton of concrete to defy the werful force of frost and thaw. Sea lls, highways, airport runways, or the ment walk in front of your home can w remain stronger, smoother, thanks to rcules Vinsol*.





SAVING TIME AND MANPOWER for the textile industry at virtually every processing step is Hercules Yarmor* 302-W Pine Oil. In one large textile mill alone, this specially designed product cut a four-hour operation to two hours and with a cash saving!

CONSERVING CRITICAL MATERIALS is but one important contribution of Hercules Poly-pale* resin to varnish resin producers. This polymerized rosin is permitting savings of glycerin and other scarce materials as high as 30% without sacrificing quality.

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rcules Staybelite*, another
sin chemical. Its ability to
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ly is important to modern
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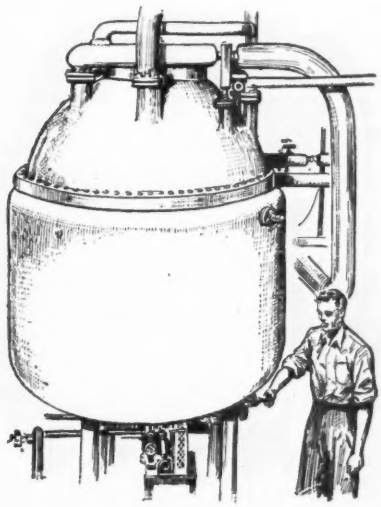
sking compositions, and
ny other adhesives.



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NH-41

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INCORPORATED
914 MARKET STREET, WILMINGTON 99, DELAWARE

422,080. **Urea-Formaldehyde Resin Plasticized with a Compatible Reaction Product of a Polyamine with a Hydroxycarboxylic Acid Having at Least 8 Carbon Atoms.** American Cyanamid Co., New York, N. Y., assignee of E. L. Kropa, Old Greenwich, Conn., both in the U. S. A.

422,188. **Artificial Dentures from Polymerized Methyl Methacrylate Mixed with Liquid.** Amalgamated Dental Co., Ltd., assignee of S. W. Wilding, both of London, England.

422,189. **In the Preparation of a Clay Film, the Use of Rubber Latex, a Water Soluble Resin or Water-Insoluble Resin as Plasticizer.** American Cyanamid Co., New York, N. Y., assignee of D. W. Light, Long Meadow, Mass., both in the U. S. A.

422,252. **Rubber-Like Flooring Composition from Sulphur, Castor, Perilla, Linseed, Tung, or Bodied Fish Oil, and Hydrocarbon Polymer Obtained by Selective Polymerization of Diolefins in Hydrocarbon Distillates.** Pure Oil Co., Chicago, assignee of M. R. Chittick, Evanston, and A. F. Schlandt, Elmhurst, all in Ill., U. S. A.

422,253. **Tough, Plastic Mastic Composition from Sulphurized Hydrocarbon Polymer, Factice, and Filler.** Pure Oil Co., Chicago, Ill., assignee of P. V. McKinney and M. G. Mayberry, both of Pittsburgh, Pa., U. S. A.

422,254. **Resilient Plastic Composition.** Pure Oil Co., Chicago, Ill., assignee of P. V. McKinney and M. G. Mayberry, both of Pittsburgh, Pa., both in the U. S. A.

422,289. **Cyanoethyl - Alpha - Chloroacrylate.** Wingfoot Corp., Akron, assignee of J. G. Lichty, Stow, O., both in U. S. A.

MACHINERY

United States

2,354,916. **Apparatus to Emboss Flexible Plastic Sheet.** V. H. Hurt, Cranston, R. I., assignor to United States Rubber Co., New York, N. Y.

2,355,238. **Machine for Coaxial Cable Insulation.** C. A. Raabe, Chicago, Ill.

2,355,420. **Vulcanizing Press.** W. J. Carter, assignor by mesne assignments to Akron Standard Mold Co., both of Akron, O.

2,355,471. **Apparatus for Covering Elastic Yarn.** A. Rosenstein, New York, and H. Dolan, Brooklyn, assignors to Rosenstein Bros., New York, both in N. Y.

2,355,613. **Press for Molding Plastics.** G. W. Wacker, assignor to Clearing Machine Corp., both of Chicago, Ill.

2,355,846. **Vulcanizer.** J. W. Brundage, assignor by mesne assignments to McNeil Machine & Engineering Co., both of Akron, O.

2,356,489. **Apparatus for Depositing Comminuted Pile-Surface Forming Material on an Adhesively Coated Backing Sheet.** J. O. Amstuz, assignor to Behr-Manning Corp., Troy, N. Y.

2,356,585. **Injector Mold.** E. Hempel, Zerbst in Anhalt, Germany; vested in the Alien Property Custodian.

2,356,858. **Portable Vulcanizer.** R. E. Laurence, Fresno, Calif.

Dominion of Canada

421,817. **Apparatus to Cover Elastic Filaments.** Filatex Corp., New York, N. Y., assignee of R. A. Gift, Jr., Trenton, N. J., and R. F. Jessen, Stanley, N. C., all in the U. S. A.

421,851. **Machine to Cover Tennis Balls.** Pennsylvania Rubber Co., Jeannette, Pa., assignee of A. C. Bowers, Akron, O., both in the U. S. A.

421,976. **Injection Molding Machine.** Hydraulic Development Corp., Inc., Wilmington, Del., assignee of J. A. Muller, Mansfield, and W. R. Tucker, Mt. Gilead, both in O., both in the U. S. A.

421,977. **Plastic Extrusion Molding Machine.** Hydraulic Press Corp., Inc., Wilmington, Del., assignee of J. A. Muller, Mansfield, and W. R. Tucker, Mt. Gilead, both in O., both in the U. S. A.

422,151. **Transfer Molding Press.** Shaw Insulator Co., Irvington, assignee of G. P. Bohrer, Union Township, both in N. J., U. S. A.

422,248. **Device to Make Hollow Thermoplastic Articles.** Plax Corp., Hartford, Conn., assignee of E. T. Ferngren, Little Neck, L. I., N. Y., both in the U. S. A.

422,285. **Continuous Vulcanizing Apparatus.** Western Electric Co., Inc., New York, N. Y., assignee of D. R. DeRoche, Stoneleigh, and D. D. Jones, Towson, both in Md., both in the U. S. A.

422,288. **Floor Matting Vulcanizer.** Wingfoot Corp., Wilmington, Del., assignee of E. Kramp, Akron, and K. B. Kilborn, Fairlawn, both in O., both in the U. S. A.

United Kingdom

561,439. **Means for Repairing Covers of Pneumatic Tires.** H. Simon, Ltd., and G. W. Calvert.

UNCLASSIFIED

United States

2,354,833. **Hose Clamp.** H. L. Roberts, Mt. Vernon, N. Y.

2,354,943. **Double-Track Auxiliary Wheel and Tire Carrier.** K. C. Clark, Watsonville, Calif.

2,354,944. **Single-Track Auxiliary Wheel and Tire Carrier.** K. C. Clark, Watsonville, Calif.

2,354,989. **Apparatus for Heat-Sealing Thermoplastic Wrapping Material.** C. J. Fusco, assignor of 45% to B. J. Ellis, both of San Francisco, and 10% to L. H. Eastin, Fresno, both in Calif.

2,355,166. **Cable Clamping Means.** H. Johanson, Brookline, assignor to Albert & J. M. Anderson Mfg. Co., South Boston, both in Mass.

2,355,204. **Automotive Vehicle Rut Filler and Antiskid Device.** K. W. Couse, Newark, N. J.

2,355,274. **Wheel Suspension.** B. Castiglia, assignor to Wheel Aligning Necessities, Inc., both of New York, N. Y.

2,355,295. **Tire Pressure Indicator.** W. Holinaty, New Westminster, B. C., Canada.

2,355,382. **Apparatus to Coat a Tire Article of Annular Form.** C. W. Leguillon, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,355,411. **Hardness Tester.** E. O. Bernhart and W. Bischoff, both in Jena, Germany; vested in the Alien Property Custodian.

2,355,562. **Hose Holder.** W. L. Rombach, Highland Park, Mich.

2,355,858. **Porosity Measuring Apparatus.** S. H. Hahn and R. H. Judson, both of Akron, O., assignors to B. F. Goodrich Co., New York, N. Y.

2,355,871. **Tube Connector.** H. T. Kraft, assignor to General Tire & Rubber Co., both of Akron, O.

2,355,980. **Spare Wheel Carrier.** J. F. Kosky and R. F. Plumb, assignor to Iowa Mfg. Co., all of Cedar Rapids, Iowa.

2,356,041. **Safety Hose Clamp.** H. E. Fay, Tujunga, Calif.

2,356,292. **Tire Protector Device.** J. H. Wildman, San Francisco, Calif.

2,356,333. **Hose Connector.** A. J. Matter, Park Ridge, Ill.

2,356,931. **Non-Skid Device.** C. W. Hunter, Bryn Mawr, Pa.

2,356,940. **Vehicle Wheel.** J. A. Marison, San Jose, Calif.

2,357,000. **Wheel Construction.** C. Hollerith, assignor to Hayes Industries, Inc., both of Jackson, Mich.

Dominion of Canada

421,614. **Cable Clamp.** H. J. Rolland, Montreal, P. Q.

421,687. **Cable Clamp.** Thexton Mfg. Co., assignee of G. L. Worel, both of Minneapolis, Minn., U. S. A.

421,702. **Apparatus to Fill Tires with Water.** Wingfood Corp., assignee of W. W. McMahon, both of Akron, O., U. S. A.

421,735. **Vehicle Wheel.** G. A. Lyon, Allenhurst, N. J., U. S. A.

421,964. **Belt Connector.** Dayton Rubber Mfg. Co., assignee of A. L. Freedlander and N. J. Ritzert, all of Dayton, O., U. S. A.

421,965. **Tractor Valve.** Dill Mfg. Co., Cleveland, assignee of J. C. Crowley, Cleveland Heights, both in O., U. S. A.

422,123. **Belt Connector.** Dayton Rubber Mfg. Co., assignee of A. L. Freedlander and N. J. Ritzert, all of Dayton, O., U. S. A.

422,295. **Apparatus for Heat-Sealing Thermoplastic Coated Wrappings.** L. Rado, Whitehaven, Cumberland, England.

TRADE MARKS

United States

408,185. **Plastifoam.** Thermal and sound insulating material. Goodyear Tire & Rubber Co., Akron, O.

408,186. **Pliofoam.** Thermal and sound insulating material. Goodyear Tire & Rubber Co., Akron, O.

408,198. **Lode.** Petroleum composition for use in compounding synthetic rubbers. R. T. Vanderbilt Co., Inc., New York, N. Y.

408,315. **Mosstypes.** Rubber printing plates and dies, and plastic printing plates. Theodore Moss Co., Brooklyn, N. Y.

408,389. **Venus.** Prophylactic rubber articles. Medicated Products Co., Chicago, Ill.

408,548. **Mutac.** Chemical composition for modifying synthetic rubber compounds. Firestone Tire & Rubber Co., Akron, O.

408,555. **Raytex.** Tires. Dayton Rubber Mfg. Co., Dayton, O.

408,627. **Modulex.** Carbon black. J. M. Huber, Inc., New York, N. Y.

408,649. **Gartex.** Silica and glass filler for compounded rubber, plastics, etc. Garco Products, Inc., Conoquenessing, Pa.

408,691. Representation of a black cross. Footwear. United States Shoe Corp., Cincinnati, O.

408,726. Representation of pen flourish around the words: **"La Patti Exclusives."** Footwear. Nusrala-Bowen Shoe Co., Inc., St. Louis, Mo

408,746. **Silvertown.** Heels, soles, and half soles. B. F. Goodrich Co., New York, N. Y.

408,806. Representation of an oval interrupted in the center of the top surface by a shield outline over which is a leaping black horse, between the words: **"Physical Culture."** Footwear. Selby Shoe Co., Portsmouth, O.

408,816. **Nervastral.** Base for rubber cement. Rubber & Pastics Compound Co., Inc., New York, N. Y.

408,818. **Velogel.** Adhesives. Firestone Tire & Rubber Co., doing business as Firestone Industrial Products Co., Akron, O.

408,819. **Veloweld.** Adhesives. Firestone Tire & Rubber Co., doing business as Firestone Industrial Products Co., Akron, O.

Rims Approved and Branded by The Tire and Rim Assn., Inc.

Rim Size	Aug., 1944
15" & 16" D.C. Passenger	
16x4.50E	29,583
15x5.00E	5,967
16x5.00F	24,729
15x5.50F	6,423
16x5.50F	4,963
16x6L	454
Flat Base Truck	
17x4.33R (6")	3,875
20x4.33R (6")	17,002
15x5.00S (7")	13,111
20x5.00S (7")	323,780
20x6.00T (8")	95,396
22x6.00T (8")	588
24x6.00T (8")	1
18x7.33V (9/10")	843
20x7.33V (9/10")	63,294
22x7.33V (9/10")	2,921
24x7.33V (9/10")	9,547
20x10.00W	834
24x10.00W	513
Semi D. C. Truck	
16x4.50E	2,312
Tractor & Implement	
16x3.00D	307
19x3.00D	939
18x5.50F	3,206
20x4.50E	4,550
24x5.50R	1,081
24x8.00T	603
28x8.00T	719
W8-24	1,812
W8-36	351
W9-28	1,592
W9-38	6,657
W10-24	1,566
W10-36	2,073
DW9-38	6,769
DW12-26	2,287
DW12-34	559
Cast	
24x15.00	130
TOTAL	750,212

Compounding Ingredients Price Changes

Butasan	lb.	$1.10	
Butyl roleate	lb.	.16	/ $0.195
Capryl alcohol	lb.	.16	/ .195
Dibutyl sebacate	lb.	.46	/ .50
Ethasan	lb.	1.10	
Extender 15	lb.	0.28	
Flectol H	lb.	.40	/ .47
Methasan	lb.	1.20	
Nevilloid C-55	lb.	.12	
Picco-100	lb.	.09	
Santoflex B	lb.	.40	/ .47
Sebacic Acid	lb.	.48	/ .55
Thermoflex	lb.	1.18	/ 1.20
Thiurad	lb.	1.25	
TR-11	lb.	0.35	

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ACCELERATORS

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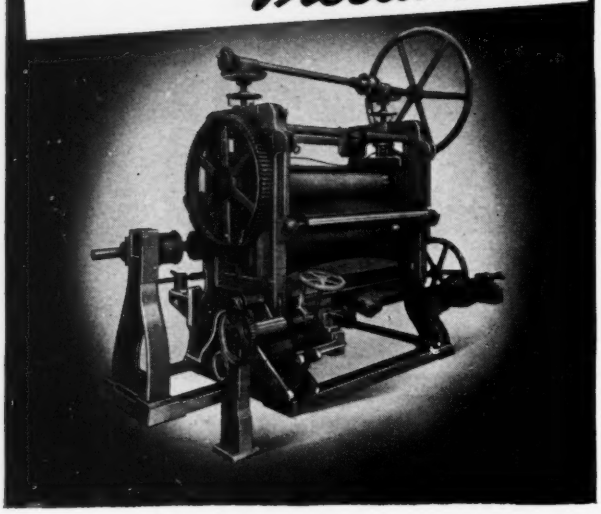
The Embosser That Regulates and Records Pressure!



WALDRON SUB FRAME EMBOSSING MACHINE

The exclusive regulating and recording features of this modern embosser indicate when equal pressure is being applied on both sides of the machine. Whatever desired pressure is required on either side to compensate for irregularity of goods can not only be maintained for the run but recorded for exactly duplicating on later runs. Machine has other notable WALDRON operating advantages—sub frame that permits quick change of design—anti-friction bearings throughout—automatic stop to prevent possible damage to engraving. Write to us for detailed information.

Among prominent users of WALDRON Embossing Machines are:—Bibb Mfg. Co.; E. I. du Pont de Nemours; Fibre Leather Mfg. Co.; Firestone Tire & Rubber Co.; B. F. Goodrich Co.; Kelly-Springfield Tire Co.; Seiberling Rubber Co.; St. Clair Rubber Co., and many others.

JOHN WALDRON CORP.
NEW BRUNSWICK, N. J.

WALDRON·U.S.A.

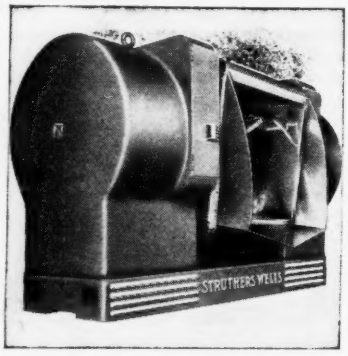
New Machines and Appliances

Gasket Shaver by General Electric

Shaver Splits Gaskets in One Cut

A DEVICE for shaving rubber gaskets to required thickness in one smooth continuous cut replaces grinding or filing operations which not only consumed considerable production time, but resulted in an uneven surface. An evenly split unit results when the gasket, which is an inch wide and 15 inches long, is placed on the cutter, held in place with a pressure wheel, and pulled forward. Adjustable nuts on either side of the shaver make possible cuts of varying thickness. General Electric Co.

Mixing Machines for Rubber Stocks



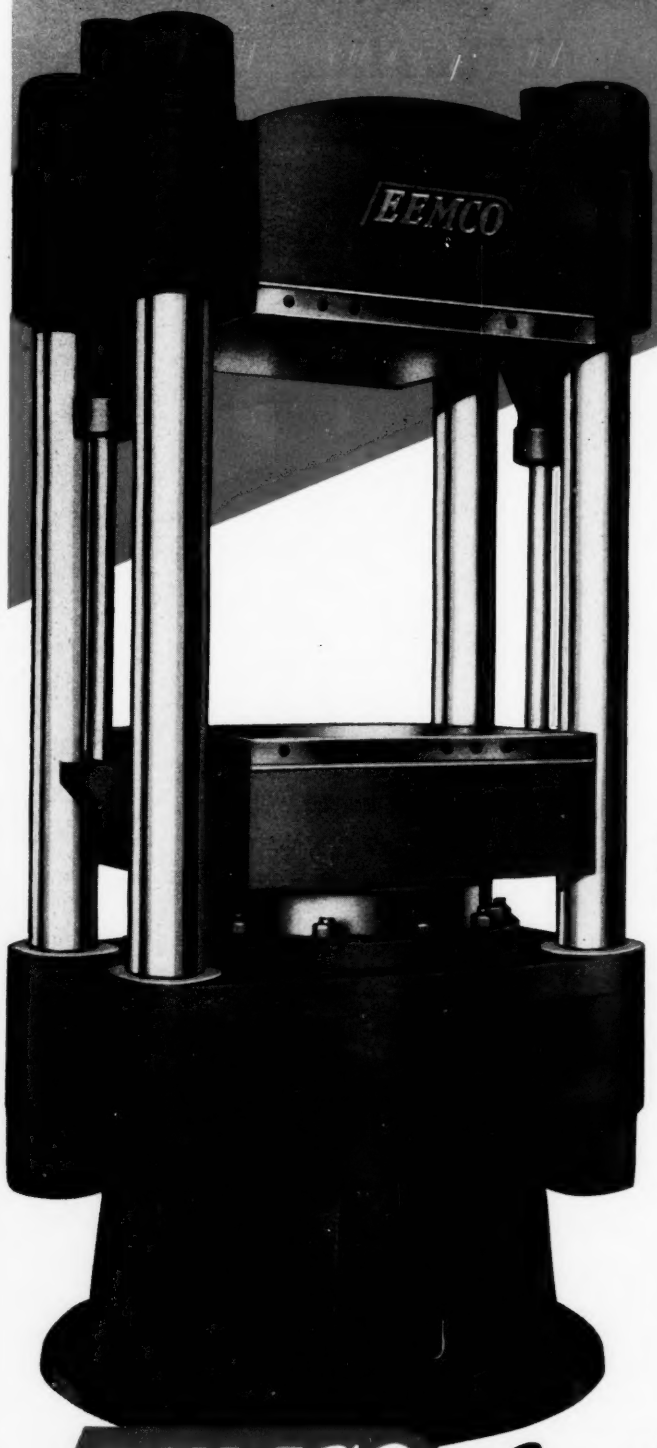
Struthers Wells Shredding Machine

A BATCH-TYPE shredding and mixing machine is reported to employ improved mixing blades which, in combination with a serrated saddle and a specially constructed mixing chamber, minimize the tendency of moistened pulp to collect in the corners of the trough above the blade and thus escape treatment. The use of corner irons or large fillets to prevent pocketing is said to be generally unnecessary in the machine, which results in increased producton and quality of product. There is a substantial increase in jacket area through elimination of the large corner fillets formerly required. The shredders are equipped with anti-friction bearings, straddle mounted driving gears, and an automatic lubrication system. With certain modifications in design and construction the machines may be used for developing high-viscosity cements and other rubber and plastic solutions. Special designs are available for breaking down, mixing, compounding, and dispersing a wide range of rubber and plastic stocks. Constructed of any commercial metal or alloy, the machines are made in sizes up to 4,0000 gallons working capacity. Northmaster Division, Struthers Wells Corp., Titusville, Pa.

Generator for Dielectric Heating

A GENERATOR for heating and drying dielectric materials is reported to be a versatile, reliable piece of equipment with possibilities of speeding manufacturing processes in the rubber and other industries. It has a rated output of 3½ kilowatt and a frequency of 20 megacycles. It operates from 205/245-volt, 60-cycle, single-phase line, and has a full load input of about 9 KV-A and a power factor of 90%. Known as Model M-200, the equipment can be separated from the electrodes so that greater efficiency and plant layout may be obtained. Induction Heating Corp.

RUBBER and PLASTICS MOLDING with EEMCO PRESSES



Made in sizes from 12" x 12" Laboratory Press up to desired sizes, EEMCO hydraulic presses comprise a line of especially built and designed presses for rubber and plastics molding. No matter what your molding requirements may be, you are invited to consult with EEMCO for your needs.

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EXTRUDERS • STRAINERS • WASHERS
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Red Lead (95% · 97% · 98%) **Sublimed Blue Lead**
Sublimed Litharge **Sublimed White Lead**
Litharge **Basic White Lead Silicate**
Basic Carbonate of White Lead

• The above products are among the comprehensive line of zinc and lead pigments manufactured by The Eagle-Picher Lead Company for the rubber, paint and other process industries. Eagle-Picher research facilities are available to manufacturers on request. Write for free samples and literature.

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General Offices: Cincinnati (1), Ohio

LATIN AMERICA

ARGENTINA

Seemingly manufacturers in South America, the home of rubber, should have no difficulty in obtaining adequate supplies for their factories. But such is not altogether the case since not all the Latin American countries are rubber-producing countries, and, furthermore, the agreements between those that do grow rubber and the United States leave very little rubber over for those that have no crude rubber sources of their own and are obliged to depend on imports.

Argentina is suffering more than any of the other republics as a result of this situation. A relatively large consumer of crude rubber, it finds that practically the only rubber available to it is the 250 metric tons which Bolivia in its agreements with the United States is able to reserve annually for allocations to friendly neighbors.

Prior to Pearl Harbor, Argentina had succeeded in becoming the premier rubber manufacturing country in South America. From a country which up to 1931 had manufactured only limited quantities of miscellaneous rubber goods and depended on imports for the bulk of its requirements in rubber articles, it had developed into a producer capable not only of supplying the greater part of its own needs of a wide variety of rubber products, but also of exporting fair amounts to neighboring countries. By 1941 the Argentine rubber industry included three factories for tires and tubes, one for tubes only, 15 for footwear, and 41 for miscellaneous goods; while the average annual consumption of crude rubber had been 8,775 tons over the five-year period 1937-1941 inclusive.

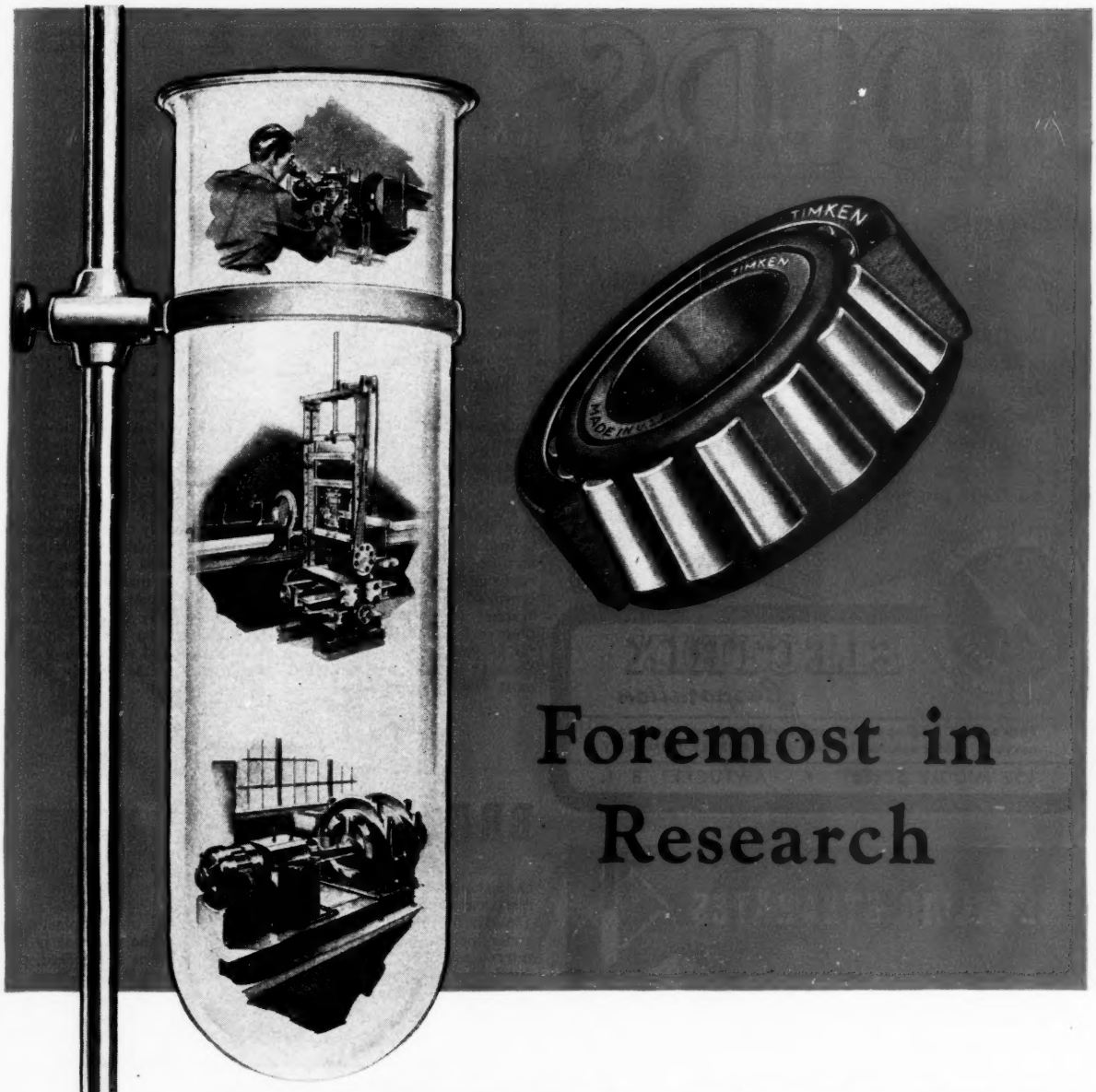
The manufacture of tires, started here in 1931 by United States and European companies, gave the development of the local rubber industry its real impetus. Production of tires and tubes increased rapidly, reaching an estimated total of 605,000 casings and 690,000 tubes in 1941. In the same year about 15,000,000 pairs of canvas rubber-soled shoes were made and more than 8,000,000 pairs of rubber heels, in addition to most of the country's needs in belting, hose, and the ordinary types of packing. A large amount of lower-grade sheeting, most of the household rubber gloves in use as well as a certain amount of surgical rubber gloves, and various miscellaneous items were also included among the rubber goods produced by this country.

While a large part of Argentina's rubber goods requirements could be met by home production, considerable amounts of better grade and special articles were imported including: better grades of footwear; special types of transmission, elevator, and conveyer belts; petroleum, rotary, and railroad hose; rubber thread; the better grades of druggists', surgeons', and hospital supplies; toys and novelties; also carriage and cart tires, a few sizes of pneumatic tires and tubes that local plants are not equipped to produce, and a decreasing quantity of original equipment casings and tubes for passenger cars and trucks which are assembled at local works.

In addition to crude rubber, the industry also imports most of its chemicals, tire bead wire, and Egyptian-type long-staple cotton.

FOR LOW HEAT BUILD-UP, USE PHILBLACK A

(FOR FURTHER DETAILS, SEE AD ON PAGE 4)



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For years The Timken Roller Bearing Company has been foremost in research and advanced engineering covering the design and application of anti-friction bearings needed by industry. Long ago our technicians established the highest standards to insure dependable operating efficiency. Millions have been spent in research and in the development of new applications. That is why most bearing problems can be solved by the use of Timken Bearings — why our recommendations are sound and correct. American industry generally acknowledges the superiority of Timken Bearings by the wide-spread use of this precision-made product year after year.

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MOLDS

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The following table gives an idea of the trend of Argentina's rubber import and export trade in the four years 1938-1941, inclusive:

Imports and Exports	Kilograms 1938	1939	1940	1941
Imports				
Casings*	448,419	331,183	380,509	128,407
Tubes*	28,802	11,870	14,786	8,150
Footwear	125,579	141,736	18,987	20,833
Erasers	13,241	14,442	12,229	1,689
Solid tires	158,042	196,890	208,393	86,351
Belting	282,884	189,345	124,300	53,410
Hose	229,029	202,194	202,116	114,206
Packing	210,801	122,053	79,401	74,319
Thread	71,693	81,781	94,652	25,774
Soles and heels	4,555	5,236	1,297	4,056
Miscellaneous	19,029	16,294	11,805	11,742
Total	1,592,074	1,298,424	1,048,475	528,937
Exports				
Casings and tubes	20,243	59,640	375,081	733,541
Hose	1,417	1,566	4,729	9,787
Other rubber products	5,019	10,672	31,638	118,975
Total	26,679	71,878	411,448	862,303
Balance				
Import	1,565,395	1,226,546	637,027	.....
Export	.....	.....	.....	333,365

* Imports do not include casings and tubes intended to be mounted on new vehicles at the assembly plants.

The Argentine Government now is searching for means to alleviate the grave rubber shortage which has already caused the nation to lose its position as leading South American rubber goods manufacturer and has reached the stage where it also threatens to disrupt motor transportation. An attempt is being made to establish a synthetic rubber industry here, and the government has already advertised for bids on a complete synthetic rubber industry. Meantime reclaimed rubber will have to substitute for crude rubber as far as possible, and stocks of crude still on hand will have to continue to be managed with the utmost care and used only for the most essential purposes.

BRAZIL

Technical problems hard to solve under wartime conditions are hampering the efforts to produce "Cafelite", the coffee plastic which Americans invented and which Brazil is attempting to exploit. Though the physical and mechanical properties of this plastic are understood to be not yet entirely satisfactory, the material is considered promising, and once the various problems are solved, production on an industrial scale will be started, and Brazil's huge coffee surpluses will begin to find new outlets.

FAR EAST

The Chinese have apparently long been in the habit of treating paper with a mixture of pigs' blood and bean curd to render it impermeable to liquids. This material is used extensively to line bamboo baskets which must serve as vegetable-oil containers.

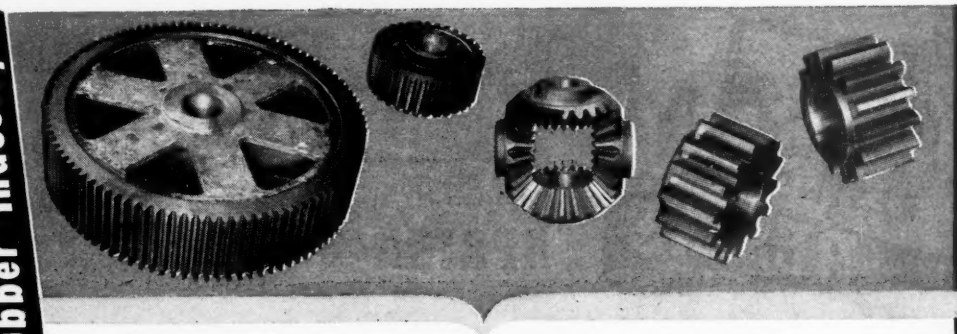
Despite the huge amounts of natural rubber available to Japan in Malaya and Netherlands India, it seems that the Japanese have started the production of synthetic rubber on an extensive scale in Manchuria.

The Manchurian Rubber Co. is said to have built and installed the largest synthetic rubber factory in the Far East and will produce chiefly neoprene. The factory will concentrate on the production of rubber for bullet-proof gas tanks for aircraft, airplane tires, and also buffers to absorb the vibration of ships' engines and thus reduce the effectiveness of submarine sound detectors.

The value of imports of raw rubber and rubber goods (excluding tires) into New Zealand in 1943 was £134,491, against £225,411 in 1942.

Local manufacturers of plastics have established the New Zealand Institute of Plastics to promote and develop the industry started here some time ago.

The numerous cottage industries of India that are devoted to making buttons, combs, unbrella handles, and other articles from horn provide considerable amounts of horn waste as a by-product,



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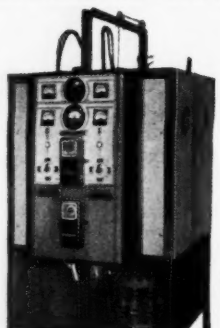

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and the Scientific and Industrial Research Council is reported to have investigated the possibility of utilizing this waste. Already some success has been achieved in this direction, and a concern in South India is producing from this waste a material claimed to have unusually good physical and mechanical properties.

AFRICA

At present South Africa has a plastics molding industry which uses imported molding powders, and it seems to be the plan to expand activities to include the local production of suitable plastics. Prospects for such an industry here are said to be favorable; ample supplies of necessary war materials, except formaldehyde, are available. A synthetic oils plant, expected to be established soon, would provide the methanol needed for the production of formaldehyde and thus also supply this material.

EUROPE

New sealing rings for canning jars, developed in Sweden of a combination of Buna and natural rubber, are claimed to be of unusually good quality. Not only do they provide seals almost indefinitely tight and safe in use, but the new rings can be stored for long periods without fear of deterioration.

To make up for the lack of rubber tires, Sweden is understood to be manufacturing a steel-spring wheel invented in Switzerland. The "Meili S" wheels, as they are called, have two sets of S-shaped springs; the outer set is designed for the rough portions of a road, and the inner set for elastically supporting the weight of the truck from the hub. Reports from Sweden claim that trucks carrying up to four metric-ton loads have been successfully driven at 65 kilometers an hour over snow-covered forest roads impassable for vehicles equipped with rubber tires and chains.

The Council for Scientific Research in Spain has reportedly granted an initial subsidy of 125,000 pesetas[1] to a new technical research institute in Barcelona to carry out investigations aimed at increased utilization of domestic raw materials and assist technically in the establishment of new industries and the modernization of existing ones.

[1] One peseta about $0.0925 U. S. currency.

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Plast-O-Dip Tank

Editor's Book Table

BOOK REVIEWS

"Illustrated Technical Dictionary." Edited by Maxim Newmark. Published by The Philosophical Library, 15 E. 40th St., New York 16, N. Y. 1944. Cloth, 9¼ by 6 inches, 352 pages. Price $5.

This dictionary functionally defines new and old terms current in the applied sciences, graphic and industrial arts, such mechanical trades as automotive mechanics, and aeronautics, and the synthetic rubber, plastics, textile, petroleum, and other industries. The selection of approved, standard definitions has been promulgated by various engineering, technical, trade and industrial organizations, and government agencies. The illustrations, of which more would be desirable, are labeled mechanical drawings of instruments, tools, and machines rather than pictorial. Industrial processes are visualized by charts and ideograms. The appendix contains some useful, but insufficient supplementary data.

"Production, Jobs and Taxes." Harold M. Groves. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. 1944. Cloth, 9 by 5¾ inches, 116 pages. Index. Price $1.25.

This study of a postwar federal tax policy was sponsored by the Committee for Economic Development. Based on the premise that new jobs are the key to stability in a world recuperating from a devastating war, specific federal tax changes that would promote high production and large employment are presented through a discussion of twelve major issues in individual and corporation taxation. Definite proposals for new or revised tax legislation to develop and preserve adequate business incentives, necessary precursors of high production and employment, are presented. The author, widely recognized as a tax expert, is professor of economics at the University of Wisconsin.

"Fats—Oils—Detergents." Interscience Publishers, Inc., 215 Fourth Ave., New York 3, N. Y. 1944. Price $36 per year, 6½ by 9½ inches in binder ($3). Twelve issues, about 800 pages.

This monthly abstract service parallels the "Resins—Rubbers—Plastics" series originated by the same publisher in 1942. All articles concerning the chemistry and technology of oils, fats, greases, waxes, and soaps and other detergents are abstracted from about 40 United States and foreign periodicals. It is expected that the 1944 series will include about 400 abstracts covering the composition, properties, constituents and components, analysis and testing, manufacture, processing and refining, and products of animal, vegetable, and mineral fats and oils.

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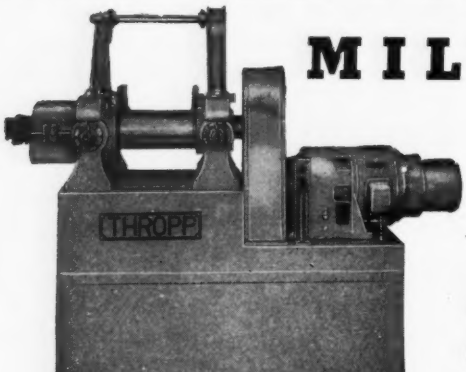

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NEW PUBLICATIONS

"Statex No. 93. The Balanced HMF Carbon." Bulletin No. 131. Binney & Smith Co., 41 E. 42nd St., New York 17, N. Y. 3 pages. Tables in this bulletin compare the physical properties of GR-S tire tread stocks containing fast curing Statex 93 with compounds utilizing other blacks. Results of modulus, tensile, elongation, hardness, and rebound rating tests show that compounds with Statex 93, which has been designed so as to balance adequate modulus with ample elongation, reduce heat build-up and improve flex cut growth resistance.

"Red GR-I Inner Tube Stocks." BL-166. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. 2 pages. In this report a comparison of the physical properties of Polyac and selenium salt activated compounds for red GR-I tubes shows a faster rate of cure, longer, flatter curing rate, and higher modulus and hardness for the Polyac stock.

"Effect of Dutrex 6 on the Age Resistance of GR-S." Shell Oil Co., Inc., 50 W. 50th St., New York 20, N. Y. 9 pages. Tables and graphs in this report show that Dutrex 6, a plasticizer and extender for GR-S, has only slight effect on the age resistance of GR-S. Data for channel-black, inner-tube, mechanical-goods, and shoe-sole compounds reveal a similarity of aging behavior in nearly all these compounds. Comparative results with other softeners are shown, as are the effects of increased proportions of Dutrex 6 in GR-S channel-black compounds containing 0, 10, and 20 parts softener, and also the effects of thiuram and thiazole acceleration. This report supplements a previous study of Dutrex 6 issued in February, 1944.

"Aging Characteristics of Litharge Activated Buna S." Rubber Circular No. 3, December 1, 1943. Research Laboratories, National Lead Co., Brooklyn, N. Y. 45 pages. Several self-explanatory graphs in this study show the effect of using zinc oxide with litharge activation in GR-S compounds. More detailed results are given in a series of tables for 15 variations of a master-batch stock containing 1.5 parts FBS litharge and 1.0 parts dibenzothiazyl disulphide per 100 parts GR-S. To this master-batch were added varying amounts of zinc oxide and sulphur, and the compounds cured at 287° F. The use of 0.75 to 1.5% sulphur and 0.75 to 2.0% zinc oxide was found to give the optimum desirable properties imparted by zinc oxide without greatly endangering the physical properties of the aged stock. Fairly rapid to relatively fast cures at moderate curing temperatures were obtained.

"1944-45 Green Book Buyers Directory." Schnell Publishing Co., Inc., 59 John St., New York 7, N. Y. 1096 pages. Free to *Oil, Paint and Drug Reporter* subscribers. This convenient annual alphabetical reference to suppliers of chemicals, oils, drugs, waxes, and related materials also contains sections listing equipment and operating supplies and technical and commercial services. Because of paper use restrictions, addresses of suppliers, formerly appearing under all materials headings, now are given in an alphabetical directory in a separate section.

"The Structure and Elasticity of Rubber." L. R. G. Treloar. Publication No. 47. The British Rubber Producers' Research Association, 19 Fenchurch St., London, E.C.3, England. 24 pages. This paper, reprinted from "Reports on Progress in Physics," (Vol. IX, 1943), shows how the elastic and other states of a rubber are related to the properties of the molecule and the arrangements of the molecules in the rubber. Evidences to support the kinetic theory of elasticity are given, and previous investigations of crystallization in connection with elasticity are reviewed. The problem of the kinetic theory applied to the elastic molecular network, which has occupied many scientists, is presented with data from the experiments of Kuhn, Wall, and others, and finally theory and experiment are compared. Analyzing the statistical data, the author suggests that the actual average length of the rubber chain may be as much as 2.5 to 4.0 times the average length arrived at from the statistical calculation.

"The Storage of 1:3 Butadiene." Second Edition. Research Bulletin No. 7.381-C. 1944. Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa. 36 pages. Extended research has been continued on the acquisition of scientific data and its relation to the economic aspects of the storage of butadiene since the first edition of this study was published in 1942. The general plan of presentation of the material in the first edition has been retained, but new data with reference to container materials, suitable protective coatings, proper storage conditions of temperature and pressure, and the most economical type of storage plant from the standpoint of both initial and annual operating cost have been incorporated.

"Some GR-S Sponge Compounds." Booklet No. 5A. R. T. Vanderbilt Co., Inc., July, 1944. 4 pages. Test data for three soft, low-density GR-S sponge compounds, cured with sulphur, Selenac, and Iuads respectively are given in this laboratory report. The summary suggests a relation between compression set and blow for a given compound. Compounds with a high per cent. blow were found to have a low compression set, and the one with the lowest per cent. blow registered the highest compression set under test.

"Synthetic Rubber Data." Western Felt Works, 4115 Ogden Ave., Chicago, Ill. 70 pages. The data presented in this manual were largely developed from research on aeronautical problems. The first section is concerned with product data on molded and extruded synthetic rubber shapes; sheets, rolls, and cut synthetic rubber parts; and various types of seals. A second section evaluates properties of several synthetic rubber compounds and blends. More space is devoted to a comparison of various special synthetic compounds with Army Air Corps specifications, United States Navy specifications, and the aeronautical materials specifications of the Society of Automotive Engineers after exposure to oil, fuel, and solvents.

"Synthetic Rubber. What It Means to America." Goodall Rubber Co., Inc., Trenton, N. J. 42 pages. Pictures and text in this booklet describe the production of GR-S in the government plant at Louisville, Ky., operated by the Goodall and four other rubber companies for the Rubber Reserve Co. In a section devoted to the aspects of future rubber production it is pointed out that the synthetic rubber industry will have a tremendous economic value to the nation as a price stabilizing influence during the time of continued rubber shortages immediately following the war. Abrasion and oil-resistant rubber hose, mechanical goods, and industrial clothing manufactured by the Goodall company and subsidiaries are also illustrated and briefly discussed.

"Inspected Gas, Oil, and Miscellaneous Appliances. Supplement to December, 1943 List." Underwriters' Laboratories, Inc., 207 E. Ohio St., Chicago 11, Ill. 18 pages. **"Eastman Organic Chemicals."** List No. 34. Eastman Kodak Co., Rochester 4, N. Y. 182 pages. **"Ross Air Scrubber."** Bulletin No. 205. J. O. Ross Engineering Corp., 350 Madison Ave., New York 17, N. Y. 4 pages. **"B. F. Goodrich Industrial Rubber Products."** The B. F. Goodrich Co., Akron, O. 12 pages. **"Guayule.** A List of References." Library List No. 10. A. J. Blanchard, United States Department of Agriculture, Washington 25, D. C. 62 pages. **"A Postwar Federal Tax Plan for High Employment."** Research Committee of the Committee for Economic Development. 285 Madison Ave., New York 17, N. Y. 48 pages.

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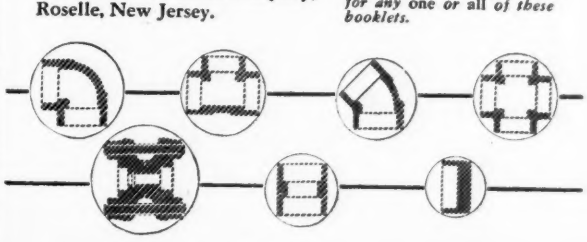

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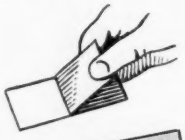

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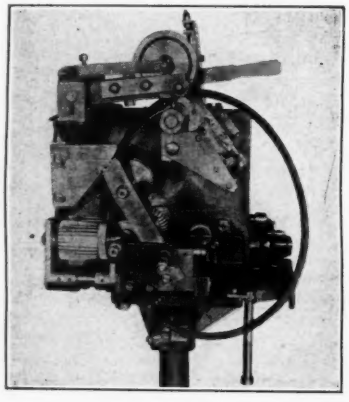

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Compression-Tear Test

(Continued from page 64)

the resistance falls off rapidly with overcure. On the other hand the better stocks show relatively flat compression-tear curves *vs.* time of cure. Road case histories are not yet sufficient to show whether the best correlations will be obtained by an average of three cures, viz., undercure, normal cure, and overcure, as at present, or by one of these alone. It appears probable that ultimately the undercure at least may be dropped from the averages with corresponding simplification of the test.

Effect upon Compression-Tear of Heat Aging the Test Pieces

The very poor stocks are easily identified without heat aging. The compression-tear values of the more highly resistant stocks do not seem to be substantially affected by aging the test pieces for 24 hours at 100° C. If anything, there is some improvement. Hence no additional information of value seems to be gained by this added complication. Such a result is quite consistent with the compression-tear curves at overcure levels.

A type of softener showing excellent behavior on aging is Resinex. This plasticizer, it may be remarked, contains chemically and physically distinctive hydrocarbons. It is a product being distributed by the Standard Chemical Co., Akron, O., and is coming into broad use because of the exceptional properties it imparts to GR-S as well as other types of synthetic and rubber compounds.

Compression-Tear at Constant Deflection vs. Constant Load

A natural question is whether the compression-tear determinations would be better made at constant load or at constant deflection. When using equipment like the Carver press, equipped with pressure gage, constant pressure readings are much simpler to make than exact linear measurements of the amount of compression. However preliminary experiments were made respectively at 2,000 p.s.i. gage pressure and at a constant compression of 60% of the height of the test piece. These data showed no appreciable differences between the two methods in the compression-tear values so long as the Shore hardness of the test pieces differs by less than five points. On the other hand if the hardness differences are greater than five points, the harder stocks show relatively greater compression-tear at constant compression than at constant load. Present road history is not sufficient to show which procedure would give the better road correlations over a wide range of hardness.

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CARTER BELL PRODUCTS
1903
SPRINGFIELD, NEW JERSEY

Regular and Special Constructions

of

COTTON FABRICS

Single Filling **Double Filling**

and

ARMY

Ducks

HOSE and BELTING

Ducks

Drills

Selected

Osnaburgs

Curran & Barry

320 BROADWAY

NEW YORK

Market Reviews

COTTON AND FABRICS

NEW YORK COTTON EXCHANGE WEEK-END CLOSING PRICES

Futures	July 29	Aug. 26	Sept. 2	Sept. 9	Sept. 16	Sept. 23
Oct. ..	21.24	21.65	21.51	21.38	21.46	21.47
Dec. ..	21.04	21.46	21.29	21.17	21.36	21.40
Jan. ..	20.92	21.33	21.17	21.07	21.31	21.35
Mar. ..	20.87	21.25	21.05	20.93	21.18	21.30
July ..	20.50	20.70	20.39	20.23	20.60	21.85

THE movement in cotton futures prices in September reflected a period of uncertainty and waiting. Pending developments in Washington and the favorable progress of the war in Europe caused traders to be cautious, and prices moved irregularly. The 15/16-inch spot middling price was 22.26¢ a pound August 31. It dropped to 21.89¢ on September 6, rose to 22.18¢ on September 12, declined to 22.02¢ September 20, and closed at 22.49¢ on October 4.

The Bureau of the Census reported cotton consumption was 841,000 bales in August, compared with 724,000 in July and 843,000 in August, 1943. Based on conditions September 1, the Department of Agriculture forecast a crop of 11,483,000 bales, 461,000 bales higher than the August 1 forecast, and a crop of that size would be 56,000 bales larger than the crop of last year.

Fabrics

Activity in the fabrics market last month was very largely influenced by several government orders and directives. Effective September 5, Amendment 24 to MPR 118 and Amendment 24 to RPS 35 increased OPA ceilings 2½¢ a pound on sheetings, drills, and four-leaf twills. This action prompted a brief flurry of business amounting to many millions of yards; then trading in these constructions subsided. Present production is insufficient to satisfy demands of both priority goods and unrated orders. Generally speaking, the rubber industry still can use sizable yardages. Osnaburgs were held at former ceilings, and while OPA action was awaited, this division of the market was largely withdrawn under price uncertainties. Only small and scattered sales of print cloths were noted.

Direction 2 to L-99, issued September 13, ordered a considerable number of looms converted from production of other fabrics to the manufacture of duck and tent twills. The WPB action is effective October 28 and affects looms on specified textiles as of July 1. It seeks to obtain a 30,000,000-yard increase in the production of tent twills and flat ducks by the end of the year. Direction 2 to M-91, effective October 1, impounded all stocks of army duck, numbered duck, flat duck, and shelter duck in excess of 500 yards in the hands of all persons, and prohibits manufacturers from using looms weaving such ducks in the early part of 1943 for the production of any other fabrics except these same types of ducks. The use of plied yarn in the production of chafer fabrics required in the production of tires is forbidden.

Reports from southern gray goods mills indicated that production was lagging at the low levels reached during summer months. Absenteeism remains widespread. Efforts to secure additional manpower have been generally ineffective. It is said the industry could absorb a quarter of a million more workers. The Armed Forces are not now obtaining all the textile supplies they want or need.

The quarterly report of the WPB Textile, Clothing, and Leather Bureau revealed a sharp reduction in the production of cotton fabrics in the second quarter of 1944. Output of woven tire cords in the second quarter was 40,580,000 yards, against 42,783,000 yards in the first quarter. Ducks, print cloths, and narrow sheetings production was also lower.

New York Quotations

September 22, 1944

Drills		
38-inch 2.00-yard	yd.	$0.195
50-inch 1.52-yard		.29
52-inch 1.85-yard		.23875
52-inch 2.20-yard		.20511
59-inch 1.85-yard		.25202
Ducks		
38-inch 2.00-yard D. F.	yd.	.215/.22625
40-inch 1.45-yard S. F.		.2975
51½-inch 1.35-yard D. F.		.335
72-inch 1.05-yard D. F.		.43/.45
Mechanicals		
Hose and belting	lb.	.3975
Tennis		
51½-inch 1.35-yard S. F.	yd.	.3275
51½-inch 1.60-yard D. F.	yd.	.28875
Hollands — White		
Blue Seal		
20-inch	yd.	.135
30-inch		.2425
40-inch		.27
Gold Seal		
20-inch	yd.	.145
30-inch		.2575
40-inch		.29
Red Seal		
20-inch	yd.	.1225
30-inch		.22
40-inch		.245
Osnaburgs		
36-inch 2.94 Cl.	yd.	.1271
40-inch 2.11 P. W.		.1623
40-inch 2.65 Cl.		.1408
40-inch 3.65 Cl.		.1095
Raincoat Fabrics		
Cotton		
Bombazine 64 x 60, 5.35	yd.	.1375
Bombazine 64 x 56, 5.50		.135
Print cloth, 38½-inch, 64 x 60		.09439
Sheeting, 40-inch		
48 x 48, 2.50-yard	yd.	.17200
64 x 68, 3.15-yard		.14761
56 x 60, 3.60-yard		.12638
44 x 40, 4.25-yard		.10352
Sheetings, 36-inch		
48 x 44, 5.00-yard	yd.	.09100
40 x 40, 6.15-yard		.07398
Tire Fabrics		
Builder		
17¼ ounce 60" 23/11 ply Karded peeler	lb.	.48
Chafer		
14 ounce 60" 20/8 ply Karded peeler	lb.	.48
9¼ ounce 60" 10/2 ply Karded peeler	lb.	.45
Cord Fabrics		
23/5/3 Karded peeler, 1 1/16" cotton	lb.	.44
15/3/3 Karded peeler, 1 1/16" cotton	lb.	.42
12/4/2 Karded peeler, 1 1/16" cotton	lb.	.42
23/5/3 Karded peeler, 1¼" cotton	lb.	.44
Leno Breaker		
8¼ ounce and 10¼ ounce 60" Karded peeler	lb.	.45

* Basis.

RECLAIMED RUBBER

THE demand for reclaimed rubber in September was more active than in past summer months. Inventories are reported to be dropping as consumption and demand increase, but supplies are termed adequate for present demand. Inquiries for carcass reclaim are heavier because of a noticeable shortage of tube reclaim. A fair volume of production of consumers' goods expected in the next few months will likely increase demand for all grades of reclaimed rubber. This demand the industry anticipates will continue into the postwar period. There is a moderately growing interest in synthetic reclaim, but production at the present is governed by the small amount of available synthetic scrap and other factors. Amendment 5 to RPS 56 and RMPR 165, Supp. Service Reg. 35, both effective September 13, increased OPA ceilings for reclaimed rubber by ¼¢ a pound and specified that the increase may also be added to charges for the services of processing scrap rubber furnished by the buyer into reclaimed rubber.

Reclaimed Rubber Prices

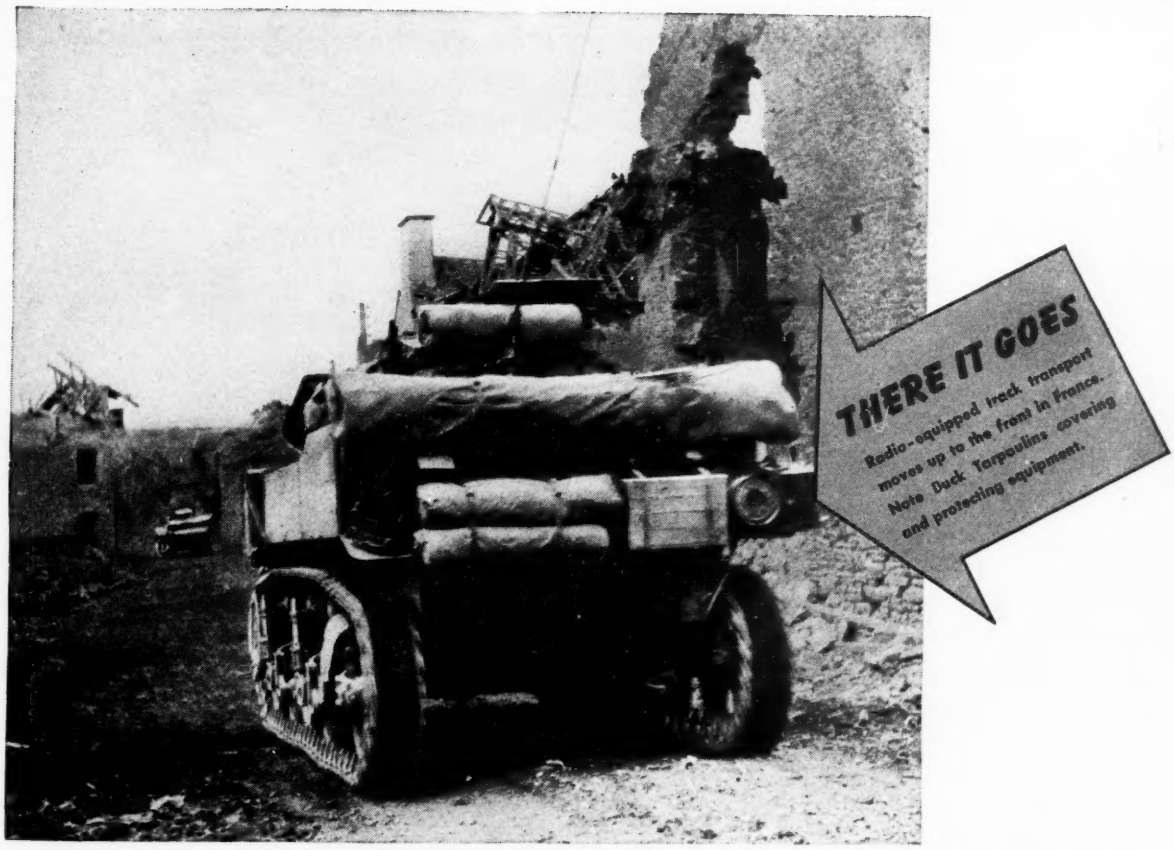
	Sp. Grav.	¢ per Lb.
Auto Tire		
Black Select	1.16-1.18	6¾/ 7
Acid	1.18-1.22	7¾/ 8
Shoe		
Standard	1.56-1.60	7¼/ 7½
Tubes		
Black	1.14-1.26	11½/11¾
Gray	1.15-1.26	12¾/13½
Red	1.15-1.32	12¼/12¾
Miscellaneous		
Mechanical blends	1.25-1.50	4¾/ 5¾
White	1.35-1.50	13¾/14¾

The above list includes those items or classes only that determine the price bases of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

SCRAP RUBBER

DEMAND for rubber scrap in September was less for some types than in previous months, but nothing was sold below ceiling prices. Requests for tire carcass were strong, and dealers found no difficulty in placing the available supply of tubes. An increased demand for red tubes compared to this season last year was reported, and it was believed that red tubes were being sought for jar rings, surgical sundries, brown heels and soles, and extruded goods. The preference demand in tubes was noticed to have definitely switched from black to red. Demand for all types of scrap is expected to increase as soon as civilian goods making begins, because of the competitive conditions incident to civilian goods production. The volume movement of scrap is not now so great as in previous months. In the light of present inventories carried by reclaimers the visible supply will take care of present and increased future demands on the basis of current collections. At the present rate of withdrawal the rubber reserve stockpile is not expected to be exhausted before the end of the first quarter of 1945.

The secretary of the War Contracts Price Adjustment Board in Washington, D. C., has announced that the petition of the Na-


THERE IT GOES
Radio-equipped track transport moves up to the front in France. Note Duck Tarpaulins covering and protecting equipment.

BEHIND THE LINES AND ON EVERY FRONT DUCK IS DOING A JOB!

From the bitter bleakness of the Aleutians to the sweltering jungles of the Marianas, duck is on constant duty, protecting men and materials.

Since it is tough, rugged and reliable, this sturdy fabric has no end of uses. Tents, tarpaulins, gun covers, munitions covers, sailors' hammocks are only part of the jobs duck does on every front. New uses, applicable to post-war development, are growing out of the fine job duck is doing in this war.

Because we supply so much of our duck to the armed forces, eight of the Army-Navy "E" awards made to the mills we represent, were for "Excellence" in the production of duck. Wellington Sears Company, 65 Worth Street, New York 13, N. Y.

WELLINGTON SEARS COMPANY, NEW YORK

tional Association of Waste Material Dealers, Inc., requesting the exemption from renegotiation of dealers in waste material under the provisions of subsection (1) (4) (D) of the 1943 Renegotiation Act has been granted.

Scrap Rubber Ceilings

Inner Tubes†	¢ per Lb.
Red passenger tubes	7½
Black passenger tubes	6¾
Truck tubes	6½
Tires‡	**$ per Short Ton**
Mixed passenger tires	20.00
Beadless passenger tires	26.00
Mixed truck tires	20.00
Solid tires	36.00
Peelings†	
No. 1 peelings	52.25
No. 2 peelings	33.00
No. 1 light colored (zinc) carcass	57.75
Miscellaneous Items=	
Air brake hose	25.00
Miscellaneous hose	17.00
Rubber boots and shoes	33.00
Black mechanical scrap above 1.15 sp. gr.	20.00
General household and industrial scrap	15.00

† All consuming centers except Los Angeles.
‡ Akron only.
= All consuming centers.

Synthetic Rubber Adhesives

TWO special cements for metal adhesion, known as the Plastilock 300 series, have been developed for use with synthetic rubber. The first is used with vulcanized neoprene when it is bonded to metal, porcelain, and similar materials; the second is used with uncured neoprene in the same applications.

Another synthetic rubber adhesive in a new line developed by The B. F. Goodrich Co. is for general "utility" use and will adhere to almost any clean surface. It is said to serve such purposes as well as natural rubber cements in the same field. Synthetic cements for heat vulcanization, air curing, or cold adhesions are also available. The compounded synthetic cements are suitable for fabric, leather, and synthetic adhesions, to themselves or to each other. These adhesives have a non-toxic solvent. They are said to give an excellent bond with a large variety of materials, and to give the same bond, when used with cured or uncured neoprene, that rubber cements give with natural rubber. Major military products on which these cements have been used include life saving boats, rubber mattresses, pontoons, balloons, diving suits, tank linings and crash pads, brake tubes, and land mines.

Statement of INDIA RUBBER WORLD

Statement of the ownership, management, circulation, etc., required by the Acts of Congress of August 24, 1912, and March 3, 1933, of INDIA RUBBER WORLD, published monthly at Philadelphia, Pennsylvania, for October 1, 1944.

State of New York }
County of New York } ss.

Before me, a notary public in and for the State and County aforesaid, personally appeared B. Brittain Wilson, who, having been duly sworn according to law, deposes and says that he is the Business Manager of INDIA RUBBER WORLD and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: publisher, Bill Brothers Publishing Corp., 386 Fourth Ave., New York 16, N. Y.; editor, Robert G. Seaman, 386 Fourth Ave., New York 16, N. Y.; managing editor, S. R. Hague, 386 Fourth Ave., New York 16, N. Y.; business manager, B. Brittain Wilson, 386 Fourth Ave., New York 16, N. Y.

2. That the owner is: Bill Brothers Publishing Corp., Caroline L. Bill, Raymond Bill, Edward Lyman Bill, Randolph Brown, all at 386 Fourth Ave., New York 16, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1% or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

B. BRITTAIN WILSON
Business Manager

Sworn to and subscribed before me this 27th day of September, 1944.

[SEAL]

WM. A. LOW.

Notary Public, Queens Co. No. 1342, Reg. No. 138-L-5. Certificate filed in N. Y. Co. No. 641. Reg. No. 388-L-5.

(Commission expires March 30, 1945)

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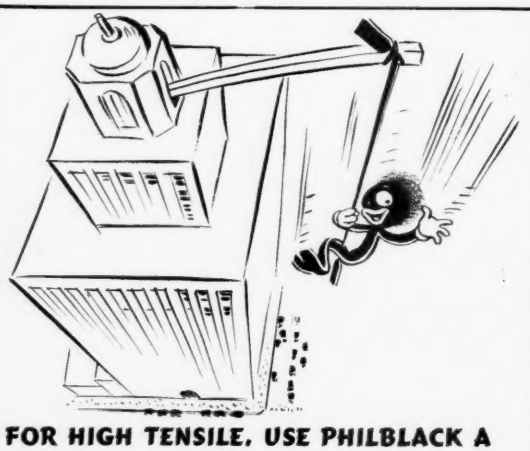

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(FOR FURTHER DETAILS, SEE AD ON PAGE 4)

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TODAY'S ODOR PROBLEMS

Leaders in the field of industrial deodorization and reodorization, Givaudan has developed a series of "neutralizing" odors for *all types* of synthetic rubbers, including Neoprene Latex.

PARADORS

(For all types of synthetic Polymers)

Paradors are available in a number of grades to meet the many different applications in synthetic formulations to which they may be applied, since it is not alone the odor of the synthetics which must be modified but also the odor developed by the addition of other ingredients to secure a special product, such as adhesives or molded items. Paradors are all different in odor character and cover a wide price range.

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Many manufacturers of synthetic rubber products are finding it practical to work with Givaudan in overcoming their odor problems. You, too, may benefit from Givaudan's knowledge and experience in overcoming odor problems. We will be glad to make recommendations without obligations.

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Light face type $1.00 per line (ten words)	Light face type 40c per line (ten words)	Light face type 75c per line (ten words)
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TIRE AND TUBE DEVELOPMENT AND CONstruction engineers, excellent opportunity in a medium-sized organization. Salary commensurate with ability. Plant located in Pennsylvania. Address Box No. 925, care of INDIA RUBBER WORLD.

CHEMIST — WITH BACKGROUND ON TIRES, tubes, or mechanical goods. This opening has real possibilities both in regard to salary and continuity of employment. Address Box No. 926, care of INDIA RUBBER WORLD.

WANTED: PLANT ENGINEER. LONG-ESTABLISHED SMALL rubber company located in Northeastern Indiana, needs services of plant engineer, or master mechanic to join staff. Applicant must be capable of doing some drafting, have knowledge of mechanics, good maintenance experience, and be able to follow through with development of production ideas. This is a newly created position, but a permanent one. This company's activities have contracted some during wartime, and it is therefore expecting and preparing for considerable expansion in its activities in the near future. An unusual opportunity will be presented to the right man joining the organization. Write fully, giving in detail experience and salary expected. Address Box No. 927, care of INDIA RUBBER WORLD.

CHEMIST WITH MECHANICAL BACKGROUND, or engineer with chemical background wanted to take charge of compounding and quality control for the production of sheet packing, gasket cloths, and rubber and asbestos packing. Research, Development and Control work. Old established company. Postwar security. W.M.C. certificate required. Please give full history, photograph, and salary desired in first letter. Address Box No. 928, care of INDIA RUBBER WORLD.

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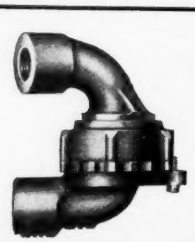

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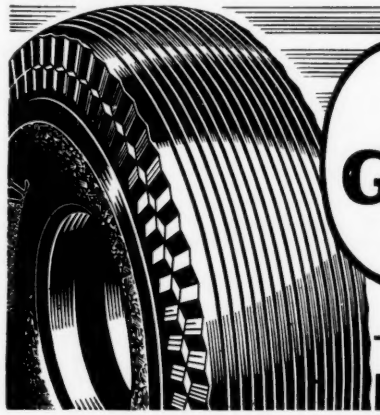

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Classified Advertisements

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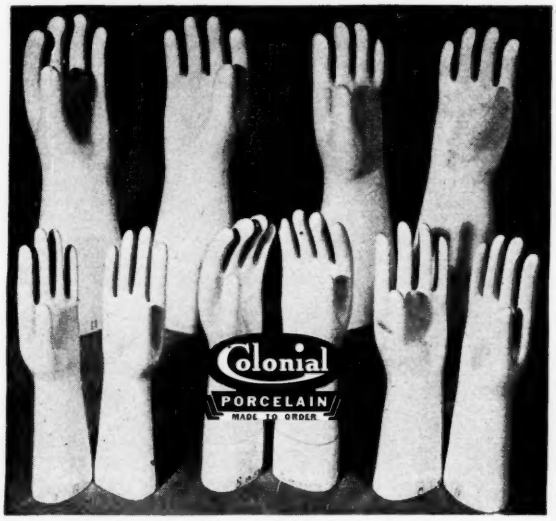

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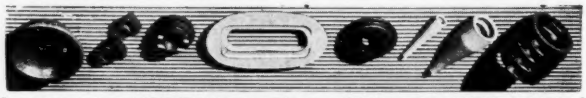

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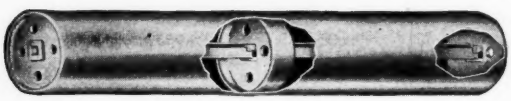

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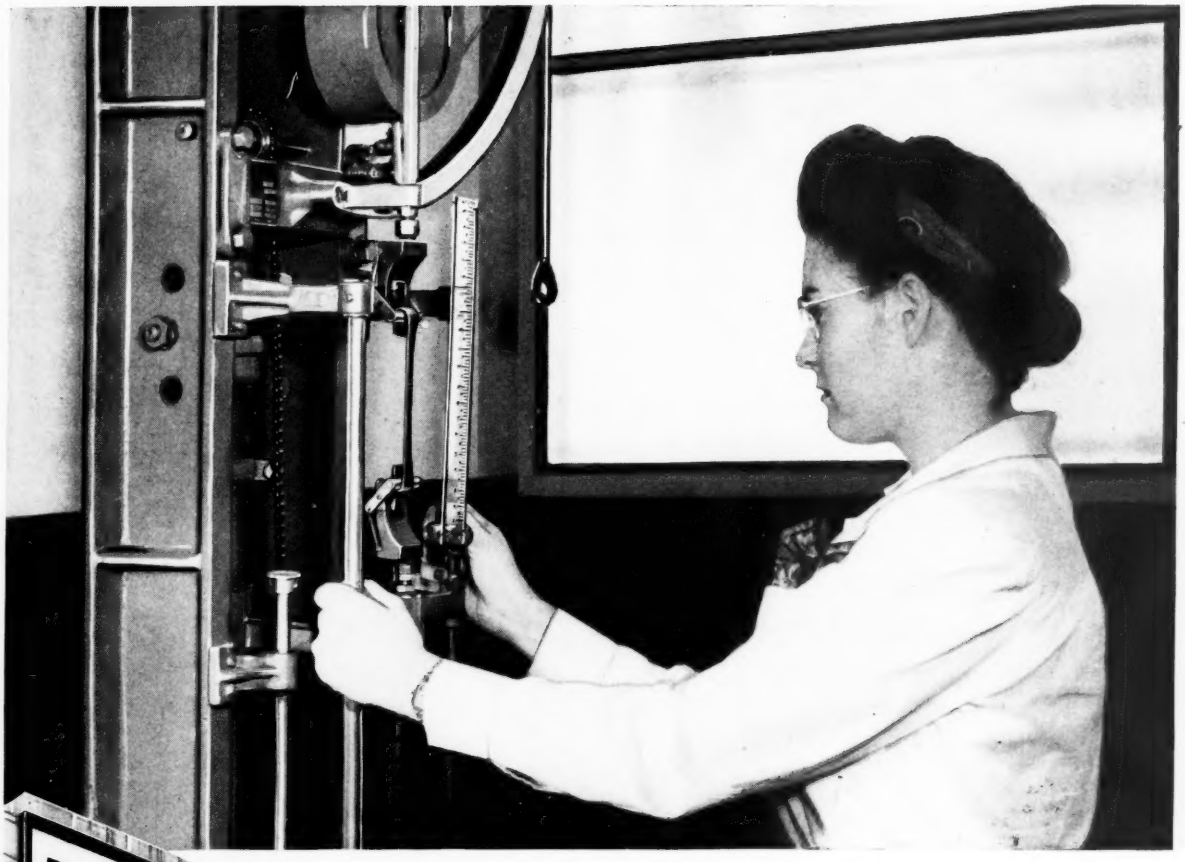

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